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Contents:

	PAGE
The Fair at Birmingham	265
Registered Electrical Contractors	266
Electricity Supply Salaries and Wages	266
The Lighting of Churches	266
Industrial Conditions in France	266
Insulators and Dirt	267
The Heating of Buildings	267
Private Plant	267
Honorary Officials	267
A Tubular-heater Factory *(illus.)*	268
Electricity Supply in Ireland, by R. N. Tweedy *(illus.)*	271
Church Lighting, by D. S. Johns	273
Screwed Drill-jig Bushes, by J. T. Towlson *(illus.)*	274
Lead Sheaths for Cables, by N. A. Allen	275
Two Transmission-line Problems, by P. J. Ryle *(illus.)*	276
The S.S. "Strathnaver"	278
Parliamentary Notes	279
Radio Loud-speakers, by P. K. Turner	279
Legal	279
Business and Industrial Notes	280
Lighting and Power Notes	285
Tramway and Railway Notes	286
Telegraph and Telephone Notes	287
Radio Notes	287
Contract Information	288
Forthcoming Events	289
Notes	290
Our Personal Column	292
Financial Section—	
New Companies Registered	293
Official Returns of Electrical Companies	294
City Notes	294
Stocks and Shares	295
The British Industries Fair—I *(illus.)*	297
Electrical Exports of Germany	305
The Heating of Buildings, by D. J. Bolton	306
New Electrical Devices, Fittings, and Plant *(illus.)*	308
Metal-clad Protection	309
Correspondence—	
The City and Guilds Examinations	310
Electricity in Rural Areas	310
Honorary Officials of the I.E.E.	310
Boiler House Problems	310
Published Specifications	311
Trade Mark Applications	311
New Work for Contractors	312

The Fair at Birmingham.

THE Electrical Section of the British Industries Fair, which is to be thrown open to Overseas and Home buyers—actual and potential—on Monday next, is the only really substantial co-operative demonstration made during the year in this country by the electrical trade. We hope that everybody is ready for a short, sharp, period of business-getting, largely of the export class, from February 16th to 27th.

We do not anticipate that the exhibition at Buenos Aires in which many of our concerns are taking part immediately thereafter will cause any reduction of interest or activity at Castle Bromwich. Indeed, it is a matter for great satisfaction that manufacturers are so interested in overseas trade extension that they have seen fit to support two efforts so near together with regard to date—one at home and the other thousands of miles away. It augurs well for the future. Let us keep British electrical industry to the fore everywhere!

We were never more convinced than now that it is a good thing for electrical manufacturers' representatives to come together at the Fair in both friendly rivalry and fraternisation under conditions which could not arise in any other way. This year there will probably be less thought given to what one may consider desirable for the future than to the actual business of exhibiting and demonstrating, answering inquiries, and booking orders. Never more than now have we needed increased industrial orders, and the state of our industries ought to act as a strong incentive to everybody to put his full energy and ingenuity into his Castle Bromwich efforts. That the electrical industry may not have suffered as others have done of late is a matter for gratification, but what is better still is the certainty that it is an industry which gives plenty of scope for further expansion, even in the present state of general depression.

As the Press view is taking place to-day so as to help newspaper and other writers to put the particulars of the Fair effectively before the public in advance, we may briefly refer to the very patent fact that without the co-operation of the Trade Press neither the Department of Overseas Trade nor the Birmingham Chamber of Commerce, nor the exhibitors themselves, can secure a full measure of success. Perhaps the two bodies mentioned appreciate the truth of this statement more than the exhibitors do. In our own experience—whether we mention the year 1915 when we helped to establish the Fair, or 1926, when we were largely responsible for reviving the electrical section which had almost gone under—we have seen this necessity for

co-operation with the Trade Press demonstrated in a hundred ways. We have lent our aid in making the event known well in advance to electrical men in all parts of our overseas markets; have used our influence as a journal to induce manufacturers to make a truly effective and representative show; and in addition we have set apart a great deal of our space to describe typical exhibits so that the Overseas or Home reader who is prevented from getting to the Fair may note the trend of British electrical production.

In the present issue, in accordance with the last of these customs, we commence our series of descriptive articles, and hope that the material thus brought together will bring buyers and sellers into immediate touch.

Registered Electrical Contractors.

LAST week we made reference to the "consummation devoutly to be wished" by all reputable contractors —a compulsory national electrical installation code. While thus hitching their wagon to a star, most of such contractors have not forgotten the existence of a voluntary scheme by which, to some extent, their ideal of safe and efficient installation work may be achieved.

A list just received from the National Register of Electrical Installation Contractors contains the names of over 1,400 firms and men who have covenanted to employ only sound materials and methods in providing electrical service to the public. These contractors are spread all over the British Isles in 367 cities and towns, and, considering the small amount of funds which the Register has available for propagating its aims, this is not a bad showing for its seven years' work.

Nobody will pretend, however, that the results are as good as they ought to be. There are something like 1,150 municipal boroughs and urban districts in England and Wales alone, and more than two-thirds of these have no registered contractors. Estimates of the number of electrical contractors in this country vary between eight and ten thousand, but the figures inevitably cover many who can only be included by extreme elasticity. Suppose half of the smaller number can be considered genuine, this still means that only about 36 per cent. of them are registered. These may be the flower of the industry, but their position remains difficult while they are in the minority. If the Register is to become thoroughly effective it must persuade *all*, or a great majority of, the reputable contractors to become enrolled. This can only be done if the public which has the placing of electrical work, particularly through its municipal representatives, is taught to regard registration as a guarantee of satisfactory installation work. Money for this form of education is scarce. Therefore, while the Register must do what it can for itself, its efforts should be strongly supported by those who are already registered and by the electrical municipalities, in particular, whose Association is represented on the Registration Board.

Electricity Supply Salaries and Wages.

ALDERMAN W. WALKER'S address to the Batti-Wallahs last week was a businesslike statement of the way in which consistency in conditions and wages has been established in the electricity supply industry. In an important utility service, more than in any other industry, harmony is essential. That is not to say that for the sake of preserving peace any demands, however excessive, should be conceded. It means that there must be some system by which the employing authorities and their employés in consultation can evolve equitable wage scales and fair conditions to apply in as wide an area as possible. Thanks largely to Alderman Walker and to the commonsense attitude taken up by most of the supply authorities and the trade unions, such a system is now in operation, with the result that a stoppage of supply, with its disastrous consequences, is now a very remote contingency.

The complaint that wages in the industry are above the normal level was replied to by Alderman Walker, who maintained that just as continuity of supply was essential so was continuity of employment in an industry of this type. By paying good wages the right class of man was secured and retained.

This argument applies with even greater force to the staff man, whose status has been very considerably raised by the National Joint Board schedule. Nobody could possibly think that the industry, by paying its engineers according to their worth, has in any way prejudiced its position. In the long run, cheap and easily-obtainable men do not mean a cheap and abundant supply.

The Lighting of Churches.

THE lighting of ecclesiastical buildings requires careful and sympathetic consideration if the system finally adopted is to be in harmony with the architecture and, at the same time, function with a maximum of efficiency for the minimum expense. Generally speaking, it is not possible to evolve a system which could be applied with universal success; each case should be approached with an open mind and all relevant features should receive full consideration before recommendations are made.

We, in this country, are particularly fortunate in the many beautiful and historical churches which are located in the various dioceses, but, owing to the crude sources of artificial light which are still employed in many cases, the interiors are visible only during daylight hours. Moreover, since there is a tendency to install stained-glass memorial windows in sanctuaries, only some sections of the buildings are sufficiently well lighted to facilitate inspection under the best of daylight conditions. If the lighting system is properly planned, it is often found that inspection at night reveals even more of archæological interest than during daylight.

In this issue we publish an article which raises some questions which we think will be of interest to those who may be called upon to advise church authorities in perhaps the quite near future.

Since supplies of electricity are to be available in the most remote of outlying districts, there is every reason for anticipating a considerable influx of business in the sphere of church lighting. Unfortunately, one of the greatest factors with which we have to contend is the factor of expense, but it is surely worth while to spend slightly more in order to protect the dignity of the building and ensure the installation of a properly designed scheme; the extra cost involved will be surely more than justified by the ultimate result.

Industrial Conditions in France.

THE depression which has for so long afflicted practically all important industrial countries is now making itself felt in France, where, thanks to the important home market, the heavy industries remained extremely prosperous long after other nations were grappling with the problem of unemployment. Throughout 1929 and the first half of 1930 the demand for skilled labour in France exceeded the supply, and large numbers of foreign workmen were allowed to enter France, whereas at the present moment there is increasing unemployment and anxiety with regard to the future. In the Parisian region the number of unemployed is said to be about 10,000. In France no labour statistics are available for the various trades, such as exist in England, but the total number of partially or fully unemployed throughout the country is believed to be ten times that figure. In the majority of factories and workshops staffs have been reduced, and the workmen retained are engaged for fewer hours per day. In the iron and steel trades the depression started about last July and, although the whole of 1930 shows only slight decreases in production, because of the prosperous conditions which obtained during the first

half, the figures for the final quarter, and particularly for the month of November, are much lower than those for 1929. The electrical industry forms a brilliant exception to the general slowing down, mainly on account of the rapidity with which electrical extensions are now being carried into the rural districts. In this direction immense progress is now being made with the aid of the important sums of money which have been voted for the purpose by the Government. It is generally realised that the industrialisation of France at the expense of her agriculture is a grave danger, that the flow of labour into the towns must be avoided, and that the distribution of electrical energy in the remote country districts is of national importance. Efforts are also being made to increase the number of telephone subscribers in the rural areas by advantageous conditions; wireless telephony has been developed and transmitters increased in power. The main object of the Government in undertaking this expenditure is to encourage agriculture, but one of the results obtained so far has been to increase electrical activity. A proof of the effect of this impetus is afforded by the continual increases in capital demanded by various electrical undertakings and in the creation of many new companies associated with the electrical industries.

Insulators and Dirt.

DURING the discussion of the paper on surge investigations submitted by MESSRS. S. W. MELSOM, A. N. ARNAM, and W. BIBBY before the I.E.E. last April it was suggested by MR. B. L. GOODLET that fouling of insulators would become the British problem instead of the natural phenomena which cause transmission-line failures in other countries.

This view received strong support in the important paper read before the Institution last week by MR. P. J. RYLE, whose investigations lead quite definitely to the conclusion that in industrial areas the primary cause of insulator trouble is dirt deposits. It is of moment to note that the addition of insulator units to the string provides no cure. Of interest, too, is the finding that sea-salt of itself plays little part in contributing towards breakdowns. One would like to know, however, whether the position in this respect would have been made worse if the prevailing wind were from the sea.

A solution is to be found, the author thinks, in the free exposure of insulator surfaces to the rain, and to that end he suggests "turning the standard design inside out." The proposal is not in itself original, but what we think is new is the idea of having corrugations that are not overhung. Mr. Ryle avoids anything like dogmatism on the subject, and is clearly of the opinion that much experimental work and observation will have to be undertaken before finality in design can be reached.

The author's qualitative investigations into the vibration of overhead-line conductors should also be of value, though the urgency of this problem is not so apparent as it is in the case of freeing insulators from deposits, which, with present designs, may be very costly.

At the conclusion of his paper Mr. Ryle drew attention to the reluctance of users and producers to divulge information regarding unsatisfactory operation, a reluctance which he considers to hinder progress. We, of course, agree, and hope with him that the example of the Newcastle-upon-Tyne Electric Supply Co. will be followed by other undertakings and manufacturers.

The Heating of Buildings.

THE field open to the use of electricity in the heating of large buildings has always appeared to us to be one of great promise, particularly in congested urban areas. We have, therefore, taken advantage of opportunities from time to time to describe outstanding installations of this kind. In our leading columns of January 16th we referred to the course of lectures being given this session at the Polytechnic, Regent Street, on the subject, with the electrode-boiler installation at that institution as a practical example. In this issue is given a summary made by Mr. D. J. Bolton of the first lecture of the series, which was delivered by him and which deals with fundamental problems. The author has been careful to justify his claims for electrical operation, and his article may be regarded as an impartial survey rather than an attempt to make out a case for the use of electricity, although, incidentally, he does do so. Much depends on the cost of energy, and in this case credit is due to the St. Marylebone undertaking for meeting the situation with a night tariff of 0.25d. per kWh.

Although we believe that "Tubular and Panel Systems" was the subject of a recently delivered lecture, we should have liked to have seen included in Mr. Bolton's comparisons the low-temperature direct electric heating systems, with thermostatic control, for which special claims as to economy of operation have been made in recent years.

Private Plant.

REFERENCES have been made recently to the possible effects of legislation touching rating and fuel in favouring the retention, or even the increase in number, of private plant in operation. Such plant, we think, generates too large a proportion of the national output, but industrialists must, of course, purchase their power in the cheapest market. If the costs of private generation are equal to those of taking supply from the public mains (after taking full account of the well-known ancillary advantages of the latter course) it is highly desirable that the industrialist should come to terms with the outside power specialist, as the increased load given to the public authority will inevitably tend towards a general reduction in costs.

It will be most regrettable if preferential rating and cheaper fuel upset the often delicate balance between the rival methods of securing a supply of electricity, and not the least because the alternative possibility of a private installation has provided a touchstone of the commercial intelligence of the public undertaking. Nevertheless, it is as well to remind ourselves occasionally that the major issue is not one of public *versus* private generation of electricity, but the substitution of electricity for other methods, whether mechanical or manual, to the greatest practicable extent. We would submit that there is, and will be for many years, a wide field for the private electrical plant as a pioneer in fostering the growth of the electrical idea in areas not yet developed by any public supply undertaking and to provide it with a nucleus load as soon as it is able to accept it on competitive terms. To become really accustomed to the day-by-day use of electricity is a very different thing from reading about its wonders in the daily Press, and the cultivation of the necessary mental readjustment among potential consumers will, in many parts of the country, be a long and arduous task.

We have not touched upon the question of electricity supply in industries requiring steam for their processes, but even in such difficult cases the increasing call for the application of electricity to all purposes may give the public undertaking its opportunity to provide supplementary supplies. Therefore we think that all electrical engineers, even if employed by statutory authorities, should, while striving to compete keenly with the smaller plant, admit its usefulness. There is a huge and untouched field awaiting their combined effort.

Honorary Officials.

WE recently referred to the yeoman service rendered to the Institution of Electrical Engineers by honorary officials at its local Centres. We asked whether the 16 years of willing service given by MR. C. T. ALLAN to the Western Centre had been exceeded. MR. E. SEDDON, this year's chairman of the Scottish Centre, informs us that MR. JOSEPH TAYLOR'S period of office as honorary secretary is (to date) not less than 18 years. We can only extend to Mr. Taylor our congratulations and sincere appreciation of his long labours for his profession as a whole. The spirit thus shown to exist is not confined in its effects to a local area; by "induction" it benefits the entire Institution.

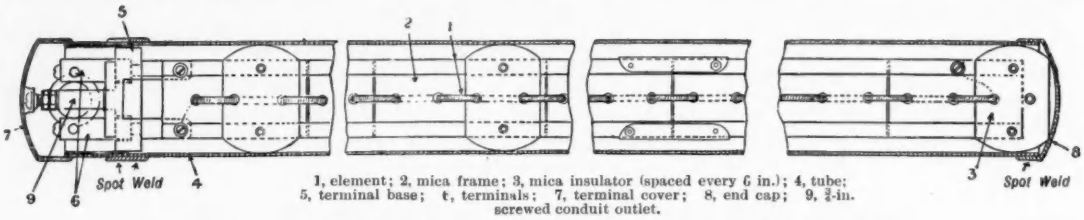
A Tubular-heater Factory.

A description of the processes employed and the equipment, etc., at the works Messrs. Young, Osmond & Young, Limited, at Welwyn Garden City.

THE past few years have seen rapid growth in the development and use of electric tubular heating, and whether or not the introduction of the newer system of electric heating has left or will make its mark on progress in connection with the more established systems, there is no doubt about the importance of tubular heating for many purposes, particularly by virtue of the excellent manner in which it lends to automatic control. We believe that the manufacture of tubular heaters has not before been described fully in a technical trade journal, and as Messrs. Young, Osmond and Young, Ltd., are pioneers in the work, and also because their factory at Welwyn Garden City was specially designed and built only two years ago for the work to which it is devoted, we trust that the following account will prove interesting and useful.

Fig. 1.—Element-frame-rolling, Metal-folding and Wire-coiling Machines.

It was a courageous move on the part of the company to commence the manufacture of equipment for such an entirely new system of electric heating at Bexley Heath, Kent, in 1925, but the subject of this article, its present factory, to which it moved after only four years' working, is evidence that the faith upon which the initial venture was established has been rewarded. The Welwyn works is at present a two-storey rectangular building about 120 ft by 60 ft. It is of brick and steel construction, with spacious windows on all sides, and the windows are made of special glass which admits the ultra-violet rays. Goods are received at and dispatched from the works by rail by means of an adjacent siding from the L. & N.E. Railway and a covered-in loading bank. A Stothert and Pitt 15-h.p. electric capstan, supplied from the factory by overhead line, serves for the necessary haulage on the siding. Raw materials are conveyed to the first floor by means of an electric hoist.



1, element; 2, mica frame; 3, mica insulator (spaced every 6 in.); 4, tube; 5, terminal base; 6, terminals; 7, terminal cover; 8, end cap; 9, ¾-in. screwed conduit outlet.

Fig. 2.—Constructional Features of a "Unity" Tubular Heater.*

Fig. 3.—View on First Floor, Showing Assembly Benches.

The product of the factory is, of course, the "Unity"

* Manufactured under British Patents Nos. 273,403, 274,931, 288,799, and 314,570, and corresponding foreign patents; registered designs and other patents pending.

heater, and to facilitate description of its manufacture it will be as well to outline briefly the patented construction of the standard tube, see fig. 2. The element proper is a nichrome-wire helix, and this is threaded through holes centrally and equally spaced along a strip of mica in order to obtain the necessary rigidity. The mica is " bound " at its edges with plated tin which serves as leading-in connections, the ends of the spirals being connected one to each tin binding. The element unit is correctly held in the wrought-iron tube by means of mica spacing pieces which insulate the metal edging from the housing. The leads are brought out to suitable terminals at one end, and the terminals are protected by a cover with a screwed - conduit outlet. The tube is sealed at the other end by a pressed-steel cap.

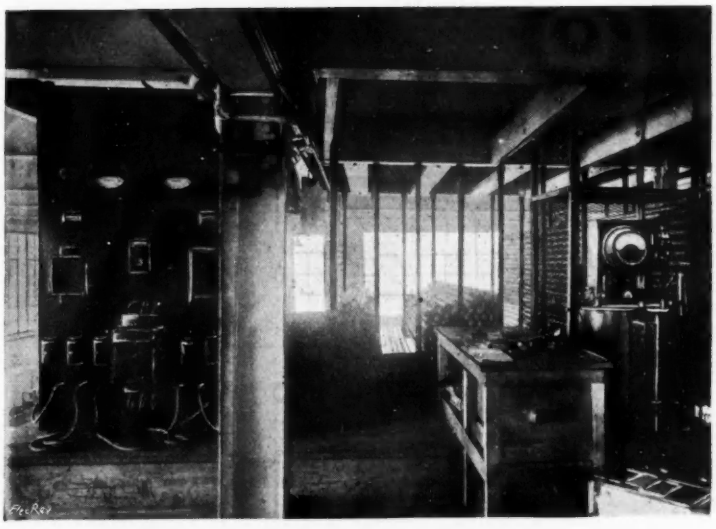


Fig. 4.—The Testing Control Equipment.

The ground floor is devoted mainly to storing component parts, except the actual tubes, to the production of stampings, caps, flanges, brackets, &c., and to the final treatment of the assembled products, in addition to packing and dispatching. A Wild-Barfield resistance furnace, fitted with an electro-magnetic critical-point indicator, for tool hardening, an electrically-driven forge and similar polishing machines are other features of the equipment on this floor. On the first floor, where the tubes are received and stored, practically the whole of the assembly work is effected, as well as the testing work. Prior to the actual assembly of the element units the nichrome wire is wound into the required spiral for tightening up and securing the metal to the mica. Fig. 1 shows a group of machines by which some of the operations referred to are performed: on the left (front) is the rolling machine, at the back is the wire winder, while on the remaining equipment is effected the folding. The insulating distance pieces are next secured by eye let rivetting on a small automatic machine. The element frames are built up in the manner indicated into the required lengths up to six feet. The element units are next inserted into the tubular housings, which work is facilitated by means of a metal gig placed over the "free" end of the tube. Connecting the ends of the element spirals to the metal edgings, and jointing the element-unit lengths together, when necessary, are included in this process by means of hand rivetting. When the tube is " filled " the circuit is finished off at suitable terminal pillars which project from the end of the tube. A porcelain terminal block is then inserted, and the whole is tightened up. A general view of the first floor is given in fig. 3, showing the assembly benches. The platforms on which the benches are erected and on which the operators stand are warmed by " Unity " heaters arranged underneath them.

Testing is the next operation of importance. For this purpose the tubes are laid in batches on a metal-covered and earthed table, and the elements (for standard heaters) are flashed at 2,000 V. For supplying the testing pressures a 20-kVA Ferranti step-up transformer is used, with a potentiometer regulator arranged across the primary winding. The testing supply is governed by a push-button on the transformer panel, fig. 4 right, which operates a contactor on the panel shown on the left of fig. 4. Megger tests are also conducted on each heater while it is on the test bench. The heaters are next suspended on a specially designed conveyor system, fig. 5, and taken to sand-blasting equipment positioned about mid-way between the two floors, fig. 6. The

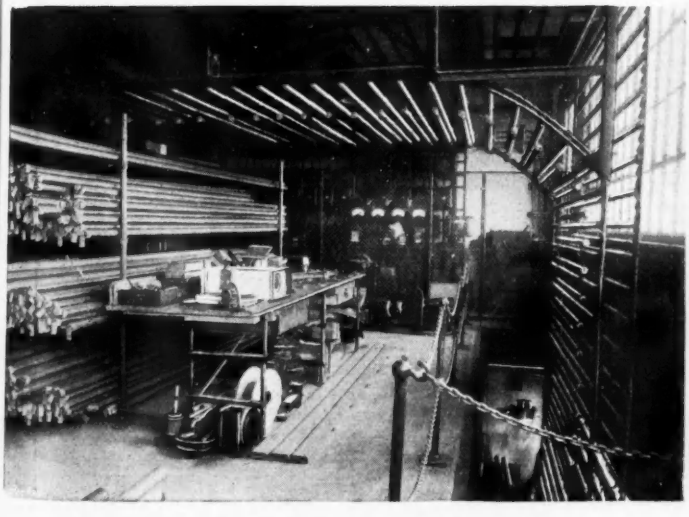


Fig. 5.—Conveyor System to Sand-blasting Plant.

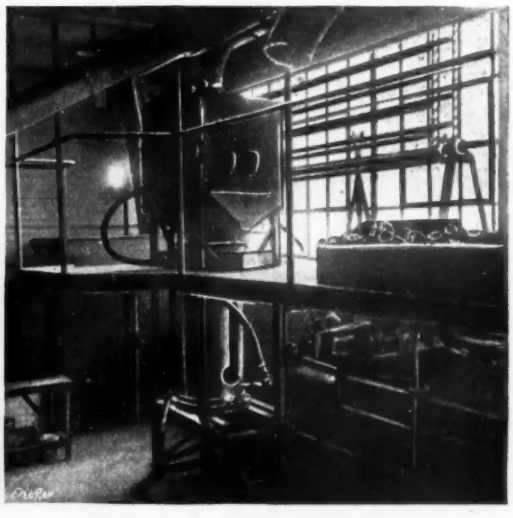


Fig. 6.—Sand-blasting Cabinet.

form on a simple revolving-rod machine, the plated tin for the edging is cut into strips on guillotine machines, and folded, and the actual mica strips are, of course, prepared. The tubes are also cut into the required lengths on a " Radiac " machine, by means of a stone disk revolving at 5,000 r.p.m., and the caps and flanges are electrically spot welded to the tube ends. The mica strips are inserted in the folded metal edgings, and the whole is then passed through electrically-driven rollers

removal of the scale from the tubes in this plant prepares them for the paint shop to which they are carried by another special conveyor system. In this shop the tubes are treated in a semi-automatic paint-spray plant in which they are carried on a continuous chain conveyor past three spraying pistols which are controlled automatically by the pulling of a single lever. This somewhat elaborate system of preparing the surfaces and painting the tubes has been the means of obtaining a very high degree of radiation from the finished heater, and also a much more durable surface than was possible previous to the installation of this equipment. After treatment in the paint-spraying machine the tubes are suspended in continuously-revolving slow-motion drying racks, and then wrapped and labelled and sent to the dispatch department.

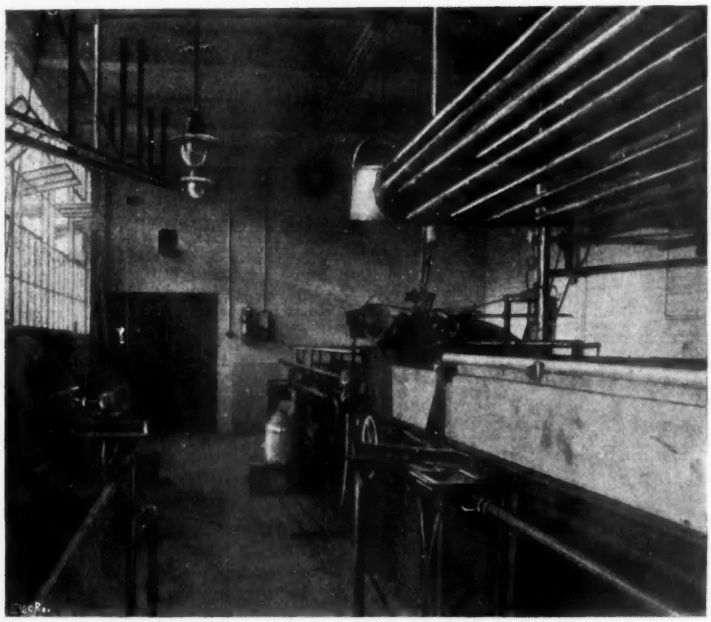


Fig. 7.—The Paint Shop; Sprayer and Drying Racks on Right.

Fig. 7 is a view in the paint shop, and fig. 8 shows the compressed-air plant for the sand-blasting and paint-spraying equipments; the two smaller compressors serve for the latter, and the large compressor serves the sand-blasting plant.

The " Unity " system of heating is employed throughout the factory with local thermostat control, in addition to time-switch governing of certain circuits. The time-switch control is part of a more comprehensive scheme, embodying the control of the power throughout the factory also, designed to avoid heavy peak loads and to keep the load factor of the installation as near as possible to unity. The whole of the electrical equipment is controlled from the board shown on the left of fig. 9, through contactors on the board at the back. The control board was designed and constructed entirely by Messrs. Young, Osmond & Young, who also carried out the whole of the installation work. Each circuit is individually served by a push button and is equipped with a fused pilot lamp, and a master switch-fuse governs the whole of the circuits. The contactors on the distribution board were supplied by Messrs. E. N. Bray, Ltd., and the board was constructed by the Astral Engineering Co. to the design of the owners. The contactors are arranged at the top and the fuse boxes are at the bottom. The supply is received from the Welwyn Garden City Electric Supply Co., Ltd., at 3,000 V at a substation on the site, from which it is transmitted to the distribution board at 415/240 V, 3-phase, 50 cycles, *via* an Erskine Heap oil circuit breaker. An interesting feature of the electrical installation is a fire-alarm system. Two-way switches are fixed at various points around the building, with one way, permanently " on," in series with a " no-volt " coil on the main circuit breaker. Changeover of any one of the switches thus opens the circuit, and it also puts a fire alarm in circuit on the other way. The meter board depicted on the right of fig. 9 is equipped with indicating and recording ammeters, a maximum-demand indicator belonging to the supply company, and a solenoid-operated excess-load audible alarm, all of which equipment was supplied by Messrs. Everett, Edgcumbe & Co., Ltd.

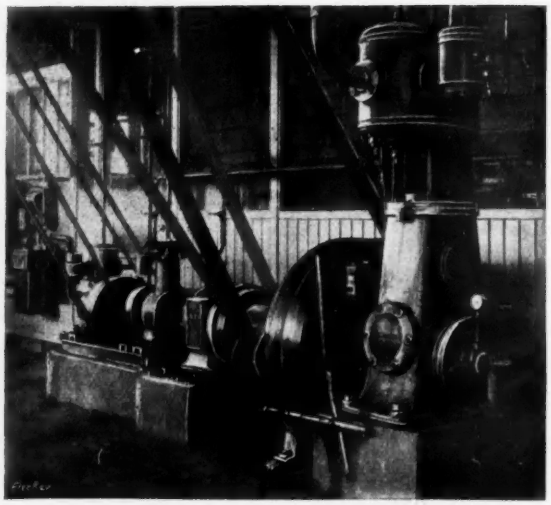


Fig. 8.—The Air-compressor Plant.

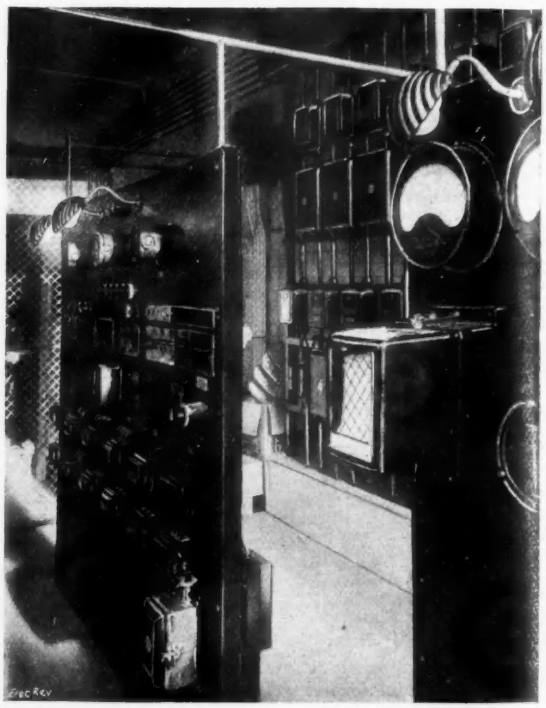


Fig. 9.—Control, Contactor, and Meter Boards.

Our thanks are due to Messrs. Young, Osmond and Young for permission to collect the above information and to take photographs.

Electricity Supply in Ireland.

The statutory powers of the Irish Free State Electricity Supply Board enable it to undertake the wiring of premises and the supply of apparatus.

By R. N. TWEEDY.

IT will be recalled that under Section 49 of the 1927 Act the I.F.S. Electricity Supply Board may manufacture, provide, sell, or let on hire anything to do with the supply and use of electricity, the only proviso being that the Board shall keep separate accounts for that part of its business, and " all charges . . . shall

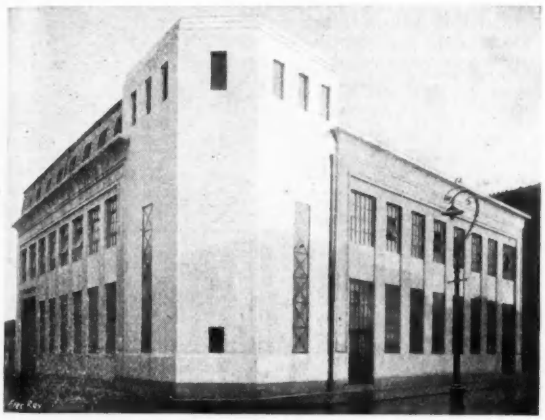


Fig. 1.—Dublin 38-kV Sub-station.

be fixed at such rates that the revenue . . . shall not be less than the expenditure incurred in or about such sale and letting on hire. . . ."

In the next Section the Board is authorised to maintain shops and showrooms for the display, sale, and hire of all things electrical, and " generally to do all things (including advertising) incidental to the provision, sale, and letting on hire of such . . ." and the promotion and encouragement of their use.

The Minister responsible for the Act was bound to do everything he could to endow the Board with every possible means to carry out the duties laid upon it by the Act, which include the control, co-ordination, and improvement of the supply, distribution, and sale of electricity generally. The situation arising out of these sections of the Act, and the intentions of the Board with relation to it, are set down clearly enough in the 1928-1929 Report of the Board from which I quote below, and it will be seen that there is little or no difference between the policy of the Board and the policy of a large and increasing number of British supply authorities.

" *Sales and House Wiring.*—In order to provide for the connection of the maximum number of consumers to the distribution networks arrangements were made for the establishment of a sales organisation with a contract and wiring department.

" The Board had no hesitation in deciding to utilise its powers under the Act with regard to the sale and hire to consumers of electrical fittings and appliances. The whole essence of the Shannon scheme being to provide cheap electricity, and the intention of the Oireachtas [the State] in placing those powers at the Board's disposal being clearly to enable consumers to obtain the advantages of electricity at a minimum cost, . . . the Board has obtained from various manufacturers of world repute different types of their specialities for careful testing by the Board's experts, both from the point of view of technical efficiency and selling value. This will provide a selection of suitable items for bulk purchase and of resale direct to consumers. . . . The contract and wiring department also carried out under direct supervision wiring contracts for private residences, institutions, &c. . . . Although limited in certain areas so as to exclude the better-class houses the wiring scheme on the hire-purchase basis proved helpful to intending consumers."

During the present financial year show- and sale-rooms have been opened in ten or twelve of the more important centres of population, and there can be no shadow of doubt but that the Board in this way has acquired new connections at a very much quicker rate than would have been possible if everything had been left to the " legitimate contractor."

Fig. 1 shows the new Fleet Street sub-station, Dublin, which is the city terminal of the 38-kV mains from the Inchicore 110-kV station. Fig. 2 is a view of one of the Stephen's Green showrooms in Dublin, part of the ground-floor display being shown in fig. 3.

Of course terrible bitterness has been evoked by this attack by what is, in effect, although not in law, a State Department with its enormously superior resources competing against private electrical contractors. The contractors did their best to come to some working arrangement with the Board, but I understand that they found the Board inflexible and unsympathetic. That is all hearsay so far as I am concerned, and I have done my best whenever a contractor has come to me registering mingled agony and terror and clasping his throat with his hands, to suggest that his throat has not been cut, and that he ought to set to work harder than ever to get the business which the Board will not touch. Long ago I wrote elsewhere that every contractor who was worth his salt would do better than ever, in spite of the Board's activities, because the people would be seized by the electrical idea and there would be a thousand consumers for every one before; far too many for the Board

Fig. 2.—Stephen's Green Showroom, Dublin.

to tackle, and large numbers of them big private house-owners or trading concerns who prefer to employ contractors rather than a " Department " to do their work.

That has come true. The volume of work to be done has swollen to such an extent that the Board, even with 800 wiremen, is unable to cope with it.

Where those 800 wiremen came from is a mystery to

everybody. The Unions assert that they are not members of their bodies, and the contractors say that most of them are not wiremen, in the approved sense, at all. Some of the work that has come under my direct observation seemed to have been done by men who had no tradition, or training. So long as contractors can keep their good men they will get as much work as they can do. Anyone who can afford to pay a contractor's price for a good job is doing so.

Of one thing you may be sure, that the Board itself is not deliberately and consciously permitting bad work to be done. It has been caught in this, as in so many other things, in the whirlwind of its own advance. It is more important for the Board than for the contractor to do first-class work, because the Board has to live with every job on its mains for ever and ever. What it could have done, of curse, was not to hurry quite so fast; but —put yourself in the place of the Board and say what you would have done if you were keyed up to making this eight million pound business pay in record time?

Even so, hurry as it may, it does not go fast enough for some people. Time after time lamentations and protests come from towns which are not yet reached by the transmission lines and will have to wait for a year or more.

There is a certain amateurishness about the Board which accents the lack of life-long training and experience in the business of public supply. Consumers will have to suffer inconveniences of various avoidable kinds until the necessary tradition has been built up; the most serious one for the consumer and the most damaging to the business of the Board being the casual way in which current is cut off whole sections of distributing network during the day for hours at a time, without notice, whenever "servicing" has to be done. Either the men cannot be trusted to work on live lines, or the Board does not yet appreciate the sacredness of the responsibility to give absolutely continuous supply, apart from unavoidable breakdown. The tradition built up over thirty-six years in the City of Dublin has not been broken, but it does not seem to carry into the more rural parts.

Fig. 3.—Ground-floor Display, I.F.S. Electricity Board's Showrooms.

The outcry about confiscation which arose when the Electricity Supply Bill was going through Parliament, over the sections which gave the Board powers to acquire compulsorily any authorised undertaking, was calculated to appeal to the vast majority of the citizens, who normally take no interest in municipal finance but become hyper-sensitive the instant they are told that they are about to be robbed.

Counting Dublin and the adjacent townships of Pembroke and Rathmines as one, the total capital expended upon electricity supply was less than £2,000,000; the total population rather less than 400,000; the aggregate maximum load (financial year 1928) 18,800 kW; and the energy sold per head of the population was at its highest in the City of Dublin at 70 kWh, Rathmines showing only half that inconsiderable figure.

The Dublin undertaking was making a big surplus, Rathmines a large and increasing loss, and Pembroke a small or a larger loss according to the way the figures were handled. Only in the case of Dublin, therefore, could anyone hold that the citizens would be at a substantial annual loss if the electricity undertaking were to be raped from them, and even in Dublin the reprehensible habit of handing over large sums from surplus to general rate relief had received a check already and was not likely to recur.

The main argument ran to the effect that the credit of the ratepayers as a whole had been pledged for the capital commitments of these municipal works, and only the ratepayers were entitled in consequence to the property in the undertakings. This was the thirty-fifth year of the City of Dublin undertaking, and all but £300,000 of its capital of over 1½ million pounds had been redeemed. I have not the figures for Rathmines, but in Pembroke there was less than £20,000 of unredeemed capital, after twenty-six years of working.

Taking them in the aggregate, not only had the ratepayer lost nothing, but he had gained a great deal. The facts became established clearly for the first time that the consumer, and the consumer alone, had paid for the undertakings, and that they should have been operated solely in his interests and for his ends.

The Act creating the I.F.S. Electricity Supply Board applied this axiom to the whole country. The consumer is to pay all and to get all. It happens that the dry light of the law has been shed upon this idea, so comforting to the consumer, so galling to the dyed-in-the-wool municipalian. When the Electricity Supply Board took over the Rathmines undertaking there was a sum of £6,035 to the credit of the municipal Council on account of the undertaking. This sum the Board demanded, but the Council refused to hand it over, alleging that it was appropriated by statute for the relief of the local rates. Mr. Justice Johnston found for the Board, and in the course of his judgment said that no question had arisen as to the general efficacy of the order under the 1927 Act by which the whole of the undertaking, property and assets of the Rathmines Urban Council in respect of the generating, distribution, sale, and supply of electricity, had been vested in the Electricity Supply Board; but the Council claimed that certain monies, representing revenue collected to date of the vesting and deposits by consumers as security for the fulfilment of their liabilities to the Council, formed no part of the property taken over by the Board.

The Judge said that a local authority constituted as an undertaker by the Board of Trade, under the Acts of 1882 and 1883, was subject, speaking generally, to the control of the Board of Trade, and carried on the business of supplying electricity quite separately from and independently of its business as a local government body, or a sanitary authority. It was placed, with important limitations, in the position of a quasi-commercial organisation. All the local bodies constituted as undertakers in 1896 were subject to very strict provisions as to the application of monies received by them as undertakers. The monies in question came from consumers of electricity and other debtors of the undertakers, and there was a very strict obligation upon the undertakers to keep these monies separate and distinct from the rates funds arising from the rates during the currency of the financial year.

"I wish," his Lordship continued, "to say something as to the capital liability that the Board has taken over. Section 39 deals with the two classes of authorised undertakings that may be compulsorily acquired by the Board—undertakings of which the local authority is the undertaker, and undertakings which are owned and carried on by an undertaker who is not a local authority. . . . Sub-sections 6 and 7 make provision for the taking over by the Board of all the capital liabilities of the first class; and Sub-section 8 provides that in the case of such undertakers as are not local authorities, the Board shall pay them a sum equal to the value of the undertaking as a going concern, the machinery for fixing the fair value in the absence of agreement being provided by the Sub-section.

"*The assumption of the legislature in sanctioning these provisions, I think, is that all electricity undertakings which are operated by local authorities are already the property of the public, and that the interests of economy and efficiency will be served best and no injustice done if all such undertakings are unified and placed under the control of one central authority, which will be entitled to all the property and assets and be liable for all the debts and charges, capital and otherwise, of the unified undertaking. On the other hand, it was recognised that the owners of undertakings which are private property must be fairly compensated if they are to be expropriated.*"

His Lordship remarked that it was not unreasonable for the Council to have made an effort to save something for its own ratepayers *whose interest was, to some extent, in conflict with that of the consumers of electricity.*

"The defendants complaint as to their loss of revenue was one that had been made before, and made in vain as in the case of the Wolstanton Urban Council and the Burslem Corporation. It must be borne in mind that the rights and property which the Board was empowered to acquire were public rights and public property, and that the power had been conferred on the Board in pursuance of a general policy of co-ordination and co-operation, which had been conceived in the general interests of a larger public. He had no doubt that what the local ratepayers would lose in one direction would be more than gained in others. He had no doubt that the general result of the working of this legislation would be a financial advantage to the ordinary ratepayer."

Less than two years after the Board took over the Dublin undertakings the managing director is able to tell us that the area under electricity supply in Dublin City and suburbs has been increased by 75 per cent.

It is results of that kind which prompt people like Sir Alexander Roger, late chairman of the British Telephone Development Association, to urge that the "telephone business of the Post Office should be autonomous and conducted on lines similar to the Central Electricity Board, the B.B.C. and other bodies."

Great as are the powers of the Electricity Supply Board they pale beside the powers credited to the Board by certain imaginative persons. For a long time after the passing of the Act it was believed commonly that all private generating plant was illegal, and that whether anyone took a supply from the Board or not he would have to pay for it. The latter idea still is current, but mostly outside the Irish Free State. In Northern Ireland, for instance, it is cited by some as an instance of the tyranny of the Free State Government, and the idea is perpetuated, curiously enough, by a misapprehension about the two-part tariff. It is alleged that the Government has imposed a tax of 12½ per cent. on the rateable value of property generally in order to meet the loss on the national electricity undertaking! As a matter of fact, I have heard consumers in Dublin refer to "the tax" as something apart from the charge which is made for electricity.

Church Lighting.

The illumination of ecclesiastical buildings introduces special problems; while each case should be considered on its merits, there are common factors which must be taken into account.

By D. SPENCER JOHNS.

THE lighting equipment for churches, unlike the architecture, furnishes one of the few instances for which we have no proper parallel in ancient practice from which to draw a precedent. Churches were used very rarely at night in mediæval times owing to the lack of erudition prevalent among the laity and their consequent inability to read. Candles were the most efficient luminants available and a large number of them had to be used; incandescent sources are much too brilliant to permit their arrangement at the low mounting heights applicable for candles, while a system of lighting churches by means of candle lamps in sconces is too expensive and too inefficient for general application. The larger the size of the incandescent lamp, the higher its efficiency in light output; accordingly the designer of the installation should eschew the use of small lamps in favour of the larger sizes available.

Evolution is a notoriously slow process and, while many lighting systems have progressed from candles to oil lamps, from oil lamps to gas, and from gas to electricity, comparatively few of our churches are lighted in conformity with modern practice. Gas, oil, and candles all tend to induce dimness and all, also, tend to leave grimy deposits: so much so that the phrase "a dim religious light" has become a synonym for poor lighting. Obviously, the construction of the building will largely determine the system to be adopted. Churches with wide aisles and comparatively narrow naves cannot be lighted to even intensity by sources pendent from the apices of the arches: moreover, wrought iron lanterns of a type suitable for installation in churches are apt to be costly, while diffusing fittings and shades are to be avoided since these tend to appear incongrous and, owing to their high surface brightness, introduce an annoyance in the form of glare. Since the congregation is constantly facing east, the presence of luminous sources in the field of vision is apt to be annoying, particularly when one such is arranged close to the pulpit from which the sermon is delivered.

It is quite apparent that a system of direct lighting will involve less expense for current consumed annually than a diffusing system, while, if properly planned, it will conserve the effects of light and shade which were intended by the designer of the building; diffusing systems, on the contrary, will tend to dispel these shadows and cause the interior to appear "flat." During daylight hours, light, in the majority of churches, comes from the clerestory level and from the windows in the side aisles. A system of properly designed reflector fittings, concealed behind hammer beams or roof vaulting in the nave and behind roof principals in the side aisles, will generally be found to conform most nearly to daylight effect. In systems of this character, an allowance of approximately one watt

per square foot of floor area, with a slightly less allowance in the side aisles, should afford an approximate intensity of three foot-candles; this is a safe figure for church lighting and should only be exceeded in rare cases, since the clergy is apt to consider high intensities theatrical. Obviously, the colour of the walls and superstructure will have an effect on the design of the installation; a red brick building will appear more dim than one the walls of which are finished in white or light stone colour, on account of the different absorption factors of the fabric. In systems of this character, care should be taken to train the reflectors diagonally across the building, since this duo-directional system of lighting tends to avoid shadows at the pew level and lessen the glare factor when the building is viewed from the east end by the clergy and the readers. The main advantages of this system are its low energy consumption, approximation to daylight effect, and absence of dense shadows at the pew level, while it conserves the shadows which normally relieve the architecture.

In cases where such a system is not practicable, it has been found that wrought-iron lanterns, incorporating a direct lighting reflector, so arranged that a maximum of light flux is directed downward while a modicum is diffused for the purpose of lighting the side panels, furnishes a satisfactory alternative. The lower mounting height of these lanterns will normally effect a slight economy in energy consumed. The diffused light, however, serves no definitely utilitarian purpose, so that an allowance of approximately one watt per square foot of the area illuminated is again a safe basis for general computations. With this system, acuity of vision is in no way impaired, but the roof and superstructure are apt to be left in darkness unless the floor is sufficiently light in character to afford a good reflection factor. Shadows, however, are apt to be rather harsh, although they should not interfere with the reading of bibles and hymnals. In small buildings, lanterns of this character may be suspended from the roof of the side aisles, just behind the adjacent arches; in larger churches it is often found necessary to suspend them from suitable wrought iron brackets, arranged just below the level of the wall plate and opposite the apices of the arches between the nave and aisles, in order to obtain a mounting height adequate to ensure even illumination.

An alternative to this system presents itself in the form of semi-hexagonal lanterns, mounted on the side walls between the springing of the arches, but an extra allowance of approximately 0.2 watt per square foot should be made to compensate for absorption in the glass panels which transmit the light flux and for the lower efficiency of the angle-type reflectors which are incorporated in these lanterns. Extra fittings obviously need to be located in the side aisles, and this system, except for certain individual cases, is apt to be less satisfactory than a system of pendent lanterns. The general effect is, however, quite good, while the daylight effect is retained.

The three systems described will be found applicable to the majority of churches built in the Gothic, perpendicular, decorated, early English, and similar styles. Special styles, however, call for special systems, and a number of schemes have been evolved which represent distinct departures from the accepted canons. In very few cases is a system of pressed, flint, or opal glass shades justifiable. They are not suitable for church work and tend to detract from the dignity of the building, while they induce factors of glare and halation, and also eliminate the shadows which are so eminently desirable in church architecture. Moreover, they are apt to collect dust and therefore, being translucent, require more frequent cleaning than opaque units. Apart from these factors it is not good policy to install a lamp of greater size than 100 watts in an open shade because of the risk of fracture through unequal coefficients of expansion; in very few cases is a 100-watt lamp adequate for proper lighting. It is, of course, practicable to install enclosing fittings of suitable design, but these are very little better than open shades, having the same disadvantages and tending, as they do, to absorb so large a proportion of the light flux emitted by the lamp.

In no case should visible light sources be used in the sanctuary. The altar is the centre of attraction and the interposition of visible units between it and the congregation is a practice to be deprecated. If there are no roof beams behind which reflectors could be adequately concealed, concentrating projectors, arranged behind the chancel arch, should serve to light the altar and reredos, while reflectors of wider dispersion may be used for the lighting of the choir stalls.

Undoubtedly, the most satisfactory and durable system of wiring in churches is the screwed-conduit system, but the varying temperatures which result from the heating of the building during week-ends only will necessitate adequate provision for the draining of moisture collected by condensation inside the tubes; the system should, of course, be mechanically continuous throughout and bonded to a positive earth by means of copper conductors of approved size. Alternatives present themselves in the form of lead-covered and c.t.s. cable, but the former should not be used where it is liable to be subjected to damage from exposure to the action of chemicals emitted by oak beams under certain conditions. It is also inadvisable to install such a system in contact with lime-stone, or where it is subjected to the depredations of rats. Tough rubber-sheathed cables, such as c.t.s. or "Virite," are quite satisfactory and are sanctioned by the fire offices concerned. It should not be forgotten, however, that rubber is itself inflammable; accordingly, where such conductors are arranged in close approximation to woodwork, they should be sheathed, wherever possible, with metal tubing. Most cable of this character is non-rigid, and it is therefore necessary to cover vertical runs from distribution boards and switchboards with some form of casing in order to ensure neatness of appearance, while horizontal runs, where visible, should be supported at frequent intervals.

Screwed Drill-jig Bushes.

The use of a threaded bush alone is not recommended.

By J. T. TOWLSON.

AS is generally known, screwed bushes, as associated with drill jigs, are never used, unless it is necessary for the bush to be employed as a means of holding the article to be drilled; this means, in quite a general way, that a screwed bush is a bit of an abomination but a necessary evil, at times.

The writer, however, believes that the "evil," the known evil, of a screwed and gripping bush may be obviated as follows:—

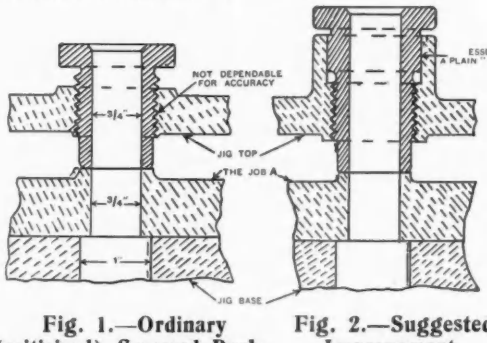


Fig. 1.—Ordinary (criticised) Screwed Bush Applied to the Drilling of the Article A.

Fig. 2.—Suggested Improvement.

As regards the suggested improvement, the obvious fact has been recognised that a screwed bush is not the right method of fitting for accurate work, and that reliance is preferably placed on a combination of plain-fitting and screw-fitting, the thread being used only for gripping the detail.

Lead Sheaths for Cables.

The Advantages of Lead Alloys, with Particular Reference to Lead-antimony.*

By N. A. ALLEN, Ph.D., M.Sc., A.M.I.E.E.

CABLES with pure-lead sheaths will, sooner or later (depending on the severity of the conditions), fail, if they are subjected to: (*a*) severe tensile stress during installation or operation; (*b*) repeated movement; (*c*) frequent or cyclic variation of temperature; (*d*) intermittent or continuous chemical attack; (*e*) electrolysis; (*f*) mechanical vibration during transport to site, or after installation; (*g*) direct mechanical abrasion; (*h*) damage by animals or insects; (*j*) combinations of two or more of the above factors.

The following are examples of the above cases: (*a*) difficult installation situations—aerial cables—cables laid on steep slopes—cables laid in ground liable to subsidences or other movement—submarine cables; (*b*) aerial cables—submarine cables—ring-main cables on ships; (*c*) aerial cables—cables on ships—cables in tropical climates; (*d*) unarmoured cables laid in ducts into which water may penetrate, or laid direct in the ground—armoured cables in soil containing chemicals—cables exposed to smoke or acid fumes—submarine cables; (*e*) all cables laid in ground whose electric potential varies from place to place, and which are therefore carrying earth currents—tramway or railway cables—cables in the vicinity of systems using an earthed return; (*f*) cables transported over long distances in ships or by rail or by road—cables installed in ships—aerial cables—cables on road or railway bridges—cables laid adjacent to railways—cables laid in roads where traffic is heavy; (*g*) cables in roadways where the trench may need re-opening—cables near gas or water-main routes—aerial cables—cables on posts or walls—submarine cables; (*h*) tropical cables generally—aerial cables (white ants, beetles, borers)—submarine cables (teredo)—factory, warehouse. and ships' cables (rats, &c.); (*j*) submarine cables which may suffer from either tensile stress, repeated movement, chemical attack, vibration, direct mechanical abrasion, or damage by the teredo worm—aerial cables, which may suffer from either tensile stress, repeated movement, variation of temperature, chemical attack, vibration, direct mechanical abrasion, or damage by insects—plain lead-covered cables in ducts, which may suffer from either tensile stress, chemical attack, electrolysis, or vibration.

The following is a list of characteristics which must be aimed at in designing an improved sheathing for cables: greater tensile strength than pure lead; higher yield point; increased resistance to crushing (hardness), but no undue increase in stiffness; increased resistance to corrosion, whether under stress or not; slower electrolytic corrosion; and higher fatigue limit—vibration is not only one of the most serious causes of cable failure at the present day, but is likely to become still more serious in the future; cost not appreciably greater than that of pure lead.

Lead-improving Alloys.

Since the very earliest days of the use of lead as a sheathing for cables, attempts have been made, by introducing other constituents into the pure lead, to improve some of the above characteristics. Among the large number of alloys which have been suggested, tried, or adopted are various percentage alloys of lead-tin, lead-antimony, lead-cadmium, lead-copper, lead-nickel, lead-bismuth, lead-manganese, lead-magnesium, lead-calcium, and/or combinations of lead with two or three of the above. Of these alloys, few have emerged from the experimental stage. There are, however, one or two alloys which are quite promising for use in the future, when practical experience has been gained with them over a period of years. Lead-cadmium-tin and lead-cadmium-antimony ternary alloys (and particularly the latter, on account of its higher fatigue limit) have been advocated in the last few years. Cadmium-containing alloys suffer from the disadvantage of being appreciably more expensive than pure lead.

The most promising alloys are the new lead-calcium (up to 0.1 per cent.) alloys recently developed in America by the Bell Telephone Laboratories. At the present time these alloys are being tested in an exhaustive manner by means of field trials on actual cables. Laboratory tests show that lead-calcium is equal, or superior, to all alloys previously proposed in respect of a resistance to corrosion, thermal characteristics, hardness, tensile strength and resistance to vibration. Its cost is also only slightly greater than that of pure lead.

Lead-antimony Research.

The first alloy to come into extensive use was lead-tin (3 per cent.), which was widely specified for land and aerial cables; it gave good results at the time, and continues to do so, although it is no longer specified for new cables on account of high cost. In 1913, an alloy of lead-antimony (1 per cent.) was adopted by the American Telephone & Telegraph Company, instead of lead-tin, for use on aerial and underground cables. This decision is understood to be influenced by the cheapness of antimony, as compared with tin, and it is known that it was made after several years continuous research on a variety of alternative alloys. Prior to this decision, laboratory tests and field tests on a large scale were conducted, and the latter included the manufacture of many experimental lengths of cable, which were then subjected to the most severe service conditions. Among other tests applied was the repeated pulling into and out of duct lines, suspension under intense vibrational stress, and subjection to corrosive influences. The lead-antimony emerged successfully from these searching investigations, was standardised for universal use, and is known to be giving exemplary service at the present time, after the passage of 17 years. Since the first introduction of lead-antimony, it has been adopted in many countries, and at the present time it is used very largely in preference to pure lead. Very little trouble has been experienced with lead-antimony sheathed cables, and in the majority of such cases the origin of the trouble may have been due to some undesirable feature in the manufacturing processes, which, more so perhaps for lead-antimony than for certain other alloys, must be based on lengthy experience and the correct interpretation and application of metallurgical laws.

The application of lead-antimony has been the subject of considerable study in the laboratories and in the cable factory of Standard Telephones & Cables, Ltd., by whose courtesy this article is published. During the last few years many thousands of tons of antimonial lead sheath have been extruded, and as a result of this work it has been established that the most advantageous composition of sheathing depends partly on the origin of the commercially pure lead which is used, and consequently upon the nature of the very small percentage of impurities therein. Due regard should be paid to

* The results of a study in the laboratories of Standard Telephones & Cables, Ltd

the fact that so-called pure lead contains about 0.02 per cent. of other material, and hence the percentage of added antimony should, within certain closely-controlled limits, be varied by the manufacturer, according to the analysis of the commercially pure lead used, so as to obtain the most satisfactory sheathing. Failure to observe this proper control of the relation between the antimonial content and the analysis of the lead itself is likely to have been one of the causes of such failures as have occasionally been reported with lead-antimony sheathing. A typical analysis of 99.98-per cent. pure lead is: bismuth, 0.009 per cent.; iron, 0.0035 per cent.; silver, 0.0005 per cent.; copper, trace; tin, trace; zinc, trace; and lead, 99.985 per cent. It has been found as a result of several years' study and experience that for lead of this composition and of closely similar impurities contents, the correct antimony content must be controlled to between 0.75 per cent. and 0.81 per cent. in order to ensure the most efficient alloy. For other impurity contents, other antimony contents may be necessary.

Lead-antimony cable alloy will now be discussed (under the same headings) in the light of the improvements mentioned above.

Tensile strength 1.66 tons per sq. in. (as against 1.02 tons per sq. in. for pure lead); hence lead-antimony sheaths withstand mechanical handling during installation, or tensile stress while in operation, better than pure lead.

Yield point approximately 1.02 tons per sq. in. (as against 0.25 ton per sq. in. for pure lead); hence repeated movement of cables has a much less harmful effect when the sheathing is lead-antimony.

Resistance to crushing (Brinell) 60 per cent. greater for lead-antimony than pure lead; hence lead-antimony cables are better able to withstand mechanical abrasion.

Corrosion—it has often, quite erroneously, been stated that lead-tin resists chemical corrosion better than pure lead or all its alloys; in point of fact lead-antimony has been found to last longer than pure lead under equal conditions of corrosion, and in the case when cables are simultaneously exposed to tensile stress and corrosive action, the life of a lead-antimony sheathed cable is about double that of a pure-lead sheathed cable.

Electrolysis—the ohmic resistance of lead-antimony is 10 per cent. higher than pure lead, hence inasmuch as electrolytic corrosion depends on the amount of stray current *picked up*, lead-antimony is less affected by electrolysis than pure lead.

(To be concluded.)

Two Transmission-line Problems.

The design of suspension insulators for use in industrial areas in Great Britain, and the vibration of overhead transmission-line conductors.

By P. J. RYLE, B.Sc. (Eng.), A.M.I.E.E.

(Extracts from a paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.*)*

THE requirements of British Standard Specification No. 137/1930 have led to insulator designs that may be expected to give fair service over 80 to 90 per cent. of the present or future areas of electrical development in this country. However, over the remaining 10 to 20 per cent. of such areas, *i.e.*, in the more industrial regions, insulators designed purely to meet the standard tests cannot be expected necessarily to give even reasonably good service. In such areas flash-overs occur most frequently under conditions of mist or fog, the effects of which atmospheric conditions are very considerably enhanced by the presence of dirt deposits on the insulators, which act in two ways. First, they encourage, by their surface roughness and absorptive qualities, the deposition of fine particles of moisture. Secondly, they enormously increase the probability of surface leakage currents being considerable on account of the fact that they usually include soluble salts, the moist dirt-film being, therefore, of appreciable conductivity. In general, the flash-over of an insulator due to such conducting films may be said to be initiated by intense local heating of the film due to the leakage current, the magnitude of which, for a given voltage across the insulator, is in turn dependent on the total surface resistance from electrode to electrode.

An area in which the inadequacy of standard insulator designs has been demonstrated is that of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and associated companies; it is largely industrial, is nowhere very far from the sea, and is frequently visited by sea-mists and fogs. Part I of the paper outlines the troubles which have been experienced on the company's 66-kV system and the methods so far adopted to limit their extent. Emphasis is laid on the nature of the distribution of dirt deposits on insulator surfaces and on the importance of insulator shape from this point of view, the standard suspension type being far from ideal under such conditions.

Some 90 circuit miles of 66-kV lines are now in commission, and the last section of line to be erected (in 1928) was equipped from the start with 5 units in both suspension and tension strings. However, it has not been found that the addition of the fifth unit, in itself, has been sufficient to guarantee good service in the most industrialised areas. The troubles are, definitely, primarily due to dirt deposits on the insulators and have not been entirely confined to the suspension strings. The poles were originally only intended to accommodate 4-unit strings, but 5-unit strings can actually be used without encroaching on any of the required clearances. It is, however, quite out of the question to add any further units. In order to ensure reasonably satisfactory operation, the insulators are now cleaned every three months in the worst areas, and every six months in certain of the less dirty regions. It is estimated that the cost of cleaning is of the order of £5 per circuit per mile per cleaning. In the worst sections, therefore, the inadequacy of standard types of insulators for dirty conditions represents an annual operating cost of £20 per circuit-mile.

In general, there seems to be little evidence that sea-salt, alone, is a very serious contributor to the trouble; however, salt is more likely to be carried inland, in the form of wind-blown spray, from a rocky coast than from a sandy shore and, therefore, salt deposits on insulators are likely to be more serious in the neighbourhood of a rocky coast. It is to be noted, however, that even on the latter section trouble has not been nearly so frequent as in dirty areas further inland.

The worst area at present is that within, say, three miles of the North Tees power station. An analysis of dirt washed off insulators in this area has shown that the deposit consists very largely of the products and residues of coal combustion, together with a considerable proportion of other chemical salts. Sodium chloride, however, forms a very small percentage (about 1.5 per cent.) of the whole. It appears probable that the sources of the majority of the deposit can be assumed to be the pulverised-fuel power station and the chemical works. From other sources of information, too, it appears that trouble is not unlikely to be experienced in the neighbourhood of pulverised-fuel stations, and on a recent visit to Germany the author was shown a complete "outdoor" 110-kV sub-station which had been roofed over and put indoors on account of trouble caused by dust from the adjacent "brown coal" station.

Most of the flash-overs recorded in the bad areas have occurred under normal system working, lightning not having been generally associated with the faults. Some may have occurred as a result of switching or other surges, but it can be assumed that the majority have taken place at normal working voltage under fog or drizzle conditions. Therefore, the practical "factor of safety" cannot be very much in excess of unity, so that the standard wet flash-over test as a design basis is obviously somewhat inadequate for insulators to be used in dirty areas.

Cleaning has not by any means eliminated trouble. The number of faults per year-mile in these worst areas appears to be still of much the same order as before the change, but the number of year-miles of operation (with the 5-unit strings)

is, perhaps, not yet great enough to make a judgment. There is little doubt that it would be quite possible to design a series of suspension insulators of totally different shapes which would all give substantially identical performances under the ordinary dry and wet flash-over tests, but which would behave very differently if put into service in a dirty area. The reason why shape has such an important effect on performance lies in the nature of the distribution of the dirt deposits over the insulator surfaces. The author's experience has invariably shown that dirt deposits are practically confined to the under-surfaces of the porcelains, and that the more an under-surface is enclosed and protected the heavier is the deposit. Dirt deposits are presumably carried to the insulator by the wind, either in a dry state or in suspension in fine moisture particles. Deposition on the porcelain surface seems to be favoured by enclosures or hollows in which the wind velocity is reduced or the air is directed into vortices and eddies in such a manner that settling of particles is encouraged.

Probably the most important cause of the cleanliness of the upper surfaces of insulators is the washing afforded by rain, which is rarely absent in this country for more than a week or so.* The practically clean surfaces are those which may be expected to receive direct rain, and experience on the N.E.S. Co.'s system has shown, without question, that exposure of the maximum proportion of the insulator surface is the best safeguard against trouble. No case of dirt trouble has yet been reported on tension strings, as they keep practically clean on both sides, even in areas where the suspension sets give trouble. Both sides of a tension unit are, of course, practically free to be washed by rain.

The reason for the shape of the standard type of suspension unit is presumably that of providing the greater proportion of the leakage path where it is best protected from the medium which is feared as being most liable to reduce the surface resistance (rain water) which falls from above, so that the

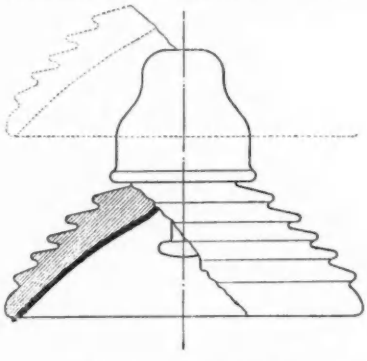


Fig. 1.—Suggested Shape of Insulator.

corrugations are naturally put on the underside of the porcelain. For dirty conditions, however, it appears that the rain is beneficial rather than otherwise, and that the medium (dirt) which has most effect in reducing the efficiency of the insulator collects from below. Briefly, the aim then becomes that of turning the standard design inside out. The author has suggested the design (patent applied for) shown in fig. 1, the chief features of which are that the corrugations are outside and are, themselves, nowhere overhung, so that all parts of the corrugated surface are open to the wind and free to be washed by rain.

Part 2 of the paper discusses the vibration of overhead-line conductors and devices for limiting its effects, emphasis being laid on the need for differentiating between the two aspects of the subject. The term "vibration" is applied to the relatively high-frequency, small-amplitude, oscillation of the conductor in the vertical plane, which is most in evidence under conditions of comparatively light transverse wind. It is not intended to refer to the swaying of the conductor as a whole, which is evident in a strong wind, nor to the so-called "dancing" of conductors (sometimes having amplitudes of several feet) which apparently is chiefly experienced with rapid changes of temperature, or loading, such as occur under sleet conditions.

The cause of vibration, which is, at any rate initially, in the plane perpendicular to the direction of the air stream, is a certain instability of the type of air flow in the wake of a cylindrical body which, especially with any slight encouragement given by resonant freedom of transverse movement of the body, sets up a system of eddies oscillating backwards and forwards across the wind behind the body. They result in an alternating force, transverse to the wind, which tends to initiate and maintain vibration. It may be noted that the oscillating effects on non-cylindrical bodies may be very different in degree, and may be zero. The frequency of oscillation of the eddies can be assumed to be a simple function of the speed of the wind and of the diameter of the conductor. If this frequency coincides with one of the range of frequencies with which the conductor, under the tension and at the span length concerned, can vibrate freely, the effect is cumulative and vibration of appreciable amplitude will build up. The amplitude reached must, in the end, be decided by the various types of damping which are called into play by the vibration of the conductor. It must be emphasised that simple weights or masses cannot absorb or dissipate energy, and cannot therefore be classed as damping devices. Damping due to relative movement and friction between the strands is probably the chief effect determining the maximum amplitude of vibration reached.

A cable strung up under tension has, among other mechanical properties, that of being able to transmit mechanical energy, without longitudinal motion, along its length, and many a.c. electrical transmission phenomena may have their counterpart in this mechanical analogy.

There would appear to be some justification for experimental investigation of the possibilities of suspension clamps fitted with springs, or even resilient pads, such as to permit slight vertical movements of the conductor and therefore of the nodal points. If some considerable degree of freedom for nodal movements could be provided, an approach would be made to the ideal of a perfectly flexibly supported conductor along which energy could be transmitted freely to be disposed of in the most desirable way, *i.e.*, by distributed dissipation throughout the whole length of the conductor.

Experience shows that vibration of overhead-line conductors tends to be most evident, and amplitudes are likely to be large:

(1) With large conductors: (*a*) because it is reasonable to expect that the energy receivable from the wind per foot of conductor is more or less proportional to the area of surface presented, and therefore to the diameter of the cable; (*b*) because for a given conductor *material* (and factor of safety), span, and wind velocity, the loop length and critical radius

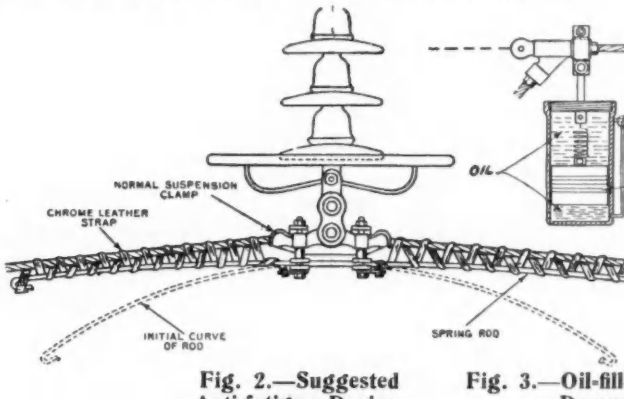


Fig. 2.—Suggested Anti-fatigue Device.

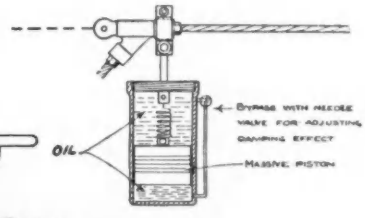


Fig. 3.—Oil-filled Vibration Damper.

of curvature may both be assumed to be proportional to the conductor diameter; but the amplitude is proportional to the square of the loop length divided by the critical radius, so that, for the above given conditions, the amplitude to be expected will be directly proportional to the conductor diameter.

(2) With tight stringing due to design or low temperature: (*a*) because for a given conductor, span, and wind velocity, the loop length will be greater for higher tensions, and the critical radius of curvature will therefore only be reached with larger amplitudes: (*b*) because, for a given conductor, the higher the tension the greater the forces necessary to overcome "stiction" and the smaller the critical radius of curvature, so that inter-strand damping will not set in until larger amplitudes are reached.

(3) With light winds, say, 2 to 20 ft. per second: (*a*) because for a given conductor, span, and tension, the loop length is short with high winds, so that the critical radius of curvature is reached before the amplitude is appreciable: (*b*) because for very low winds indeed, air damping and elastic hysteresis are appreciable in comparison with the very small energy receivable from the wind. Again, it is likely that very low winds, say 0 to 2 ft. per sec., are, relatively, more variable than normal breezes in time and in distribution over the span, so that the probability of any one mode of vibration being built up is remote.

Vibration has occasionally been suspected as being the cause of certain insulator troubles, but the most frequently quoted ill-effect is failure of the conductors themselves (most frequently reported as being at, or in the neighbourhood of, the clamps which support the conductor) due to mechanical fatigue in the strands.

The two distinct classes of remedial apparatus are (1) anti-fatigue devices (generally designed to reduce conductor alternating bending and shear stresses due to vibration) and (2) true dampers (not in any way concerned directly with stresses, but having as their prime object the limitation of vibration itself). Several such devices have been developed and tried out with considerable success. That shown in fig. 2 (patent applied for) might be partially effective in both fields. The rod is intended to take a considerable share of the

* This part of the paper expressly refers to Great Britain. The parallel problem in countries where rain is infrequent may be very different.

alternating components of the vibrational bending and shear stresses, and the chrome leather binding has the advantage that no additional "hard-spot" clamps are attached to the conductor. It is also expected that this binding might be fairly effective as a true damper, especially for vibrations in the higher part of the range of likely frequencies. True damper investigation appears to have been carried out to only a very limited extent; the perfect damper should start to dissipate energy while amplitudes are still infinitesimal and that shown in fig. 3 (patent applied for) might prove effective.

Discussion.

The author illustrated his paper with lantern slides of insulators under outdoor tests at North Tees, and demonstrated to the meeting by means of a long suspended chain wave motion, point nodes, and the transmission of energy along a vibrating line.

Mr. B. Welbourn thought the paper should be of value to operating engineers as well as designers and makers of insulators. Data which the author and others had made available for the E.R.A. would help B.E.S.A. also. Sir William Slingo had once suggested that the Post Office should use one white insulator at intervals to assist visual examination from the ground. He had recently been asked for advice about a line that crossed a sugar plantation, which was attacked by an insect pest. After feeding on the sugar canes, large numbers of the insects settled on the insulators to sleep and deposited their sugar secretion thereon; the line behaved normally during the daytime in sunlight, but when dew fell in the evening it refused to function. Anti-fatigue devices consisting of short lengths of supplementary wires bound to the main conductor had been used in various countries, and the speaker exhibited a kinematograph film which had been sent him by Mr. T. Varney from the U.S.A. to illustrate the method of attachment.

Dr. E. H. Rayner described at length what the National Physical Laboratory was doing for the Central Electricity Board. Artificial fog-chamber tests were not favoured, so it was decided to investigate the atmospheric pollution of insulators under natural conditions. A large tower had been erected at Glasgow, from which some 20 complete strings of insulators were hung in such a way as to enable continuous impedance bridge measurements to be made from the ground; the various losses could thus be separated and the observations so far made promised to reveal extremely useful information. His colleague who was conducting that field work agreed with the author's contention that plenty of vertical surface that could be rain-washed was desirable.

Mr. H. W. B. Gardiner, discussing vibration, could not agree that the lag of the clamp behind the conductor was due to the former's size or mass, but thought it was an effect of energy transfer beyond the clamp.

Mr. N. E. P. Harris said that a large measure of agreement with such a controversial paper could not be expected; the author and himself were probably in full accord only relative to the large amount of assumption that had been made. If the under surface of an insulator was of little use, how did it manage to function at all when its upper surface was coated with a saline deposit? Horizontal tension strings could be used in the worst localities, so that drippings would fall free instead of on to the line unit, which was the most highly stressed electrically. He also had made vibration tests and had obtained startling results; but, instead of attaching the test line rigidly as the author had done, his was supported by insulators to approximate more nearly to normal conditions. It was possible to shake the iron work of English, German, and American specimens to pieces, though the porcelain would still be capable of withstanding electrical tests afterwards.

Mr. W. J. John also failed to appreciate the uselessness of the underside of an insulator. None of the suggestions in the paper could do much beyond prolonging the cleaning period, which was perhaps all one could expect to do.

Mr. P. D. Morgan objected to the term "stiction," for the friction between two surfaces was not static, but dynamic. The work of Varney, Bates, &c., showed that anti-vibration devices were already available, whereas the author's suggestions were unaccompanied by confirmatory experimental results.

Major T. Rich indicated that care must be exercised not to dogmatise or standardise too much when insulators were concerned. Types which were functioning quite satisfactorily in some countries were prohibited in England by the specifications. The horizontal type might avoid trouble in some cases, but in the tropics allowance would have to be made for the difference of temperature at the top and bottom; moreover, in some countries where rain was not so frequent as in England, its washing action would be absent, whereas deposition might still occur.

Mr. P. J. Ryle, in reply, said that the use of occasional white insulators would serve to indicate more easily when cleaning became necessary, and also might facilitate the photographing or sketching of the surface deposits. He agreed that it was not easy to simulate working conditions artificially in a fog chamber, and that salt and dirt depositions were different propositions. It was too soon to attempt insulator standardisation.

The S.S. "Strathnaver."

Preliminary details of an electrically-propelled ship built for the P. & O. Co.'s Anglo-Australian service.

THE first of the two ships now being built for the Peninsular and Oriental Steam Navigation Co.'s Australian service was launched at the Barrow shipyard of Messrs. Vickers-Armstrongs, Ltd., on February 5th and has been named *Strathnaver*.

The main general particulars of the vessel are as follows:—Length overall, 664 ft.; length, 630 ft.; breadth, 80 ft.; draught, 29 ft.; speed, 22 knots; shaft horse power, 28,000; first-class passengers, 498; tourist-class passengers, 668; officers, engineers, and crew, 476.

The hull is sub-divided by 12 watertight bulkheads, the doors of which can be operated by hand or electric power, the latter ensuring instantaneous closing from the bridge in an emergency. The rudder is operated by electro-hydraulic steering gear with telemotor and automatic control from the bridge and mechanical control from the docking platform aft.

The deck auxiliaries include a high-power electric windlass, two electric warping capstans forward and two aft, and electric drive is also used for the cargo and boat-hoisting winches. The ship is electrically lighted throughout, the auxiliary power plant consisting of three turbo-generators of 750 kW, and one of 400-kW capacity, and advantage has been taken of the electricity supply for the galley cooking ranges, bakers' ovens, and other kitchen and pantry gear. For the carriage of frozen cargo CO_2 refrigerating plant is fitted.

Two passenger lifts serve the first-class dining-room foyer and 5 of the 9 decks. An up-to-date laundry is equipped for dealing with the ship's napery as well as the passengers' requirements.

Ventilation is effected by both natural and mechanical means. The Thermotank Co.'s punkah louvre system has been installed generally for supplying air, which can be warmed when necessary, whilst exhausting generally is by mechanical means. An inter-communicating telephone system, with electric megaphones where required, is installed in all the principal working parts of the vessel, and a kinema and music loud-speakers have been provided for all passengers.

The main propelling machinery consists of two separate turbo-alternators, each with its own condensing plant and auxiliaries, supplying power to two low-speed synchronous motors coupled direct to the twin propeller shafts, a contactor cubicle being provided to control the power from the alternators to the propulsion motors. Variation of propeller speed in either direction is obtained by varying the turbine speed, and is directly under the control of the engineers at the control panel. The direction of rotation of the propeller is changed by reversing the connections of two of the three phases leading from the alternators to the motors by means of contactors operated by levers located on the control platform. The main propelling equipment may be classified in three sections, as follows:—Two B.T.H.-Curtis turbo-alternator sets, 10,700 kW, 3,000 r.p.m., 3,000 volts, 3-phase; two synchronous propulsion motors, each of 14,000 s.h.p., 125 r.p.m., 3,000 volts, 3-phase: one control-apparatus group; and also the necessary balancer-booster sets and ventilating fans.

At the forward end of the instrument panel are isolators, each being triple pole, operated by handwheels, to enable each alternator to be electrically connected to its respective propeller motor, or either of the alternators to both propeller motors. The controls are so interlocked that damage cannot be done to any portion of the equipment when manœuvring by an unskilled operator. At the same time, indicating instruments are provided by means of which an intelligent operator can carry out orders in a very short space of time with a minimum of manual effort. For each propeller, three controlling levers are provided for operating contactors and speed settings of the turbine governor; a direction lever, field lever, and speed controlling lever, all mechanically interlocked to ensure correct operation.

The steam-generating installation consists of four Yarrow water-tube boilers of the five-drum, double-flow, side-fired type, fitted with superheaters and tubular air preheaters, working at a pressure of 400 lb. per sq. in. The steam is superheated to 725 deg. F. Two auxiliary boilers are to be provided of similar design and type to the main boilers, all arranged to burn oil-fuel only under the Howden forced-draught air-duct system, electrically driven. The two main condensers are of the Weir regenerative type, having a total cooling surface of 32,000 sq. ft., sufficient to maintain a vacuum of 28 in. with a sea temperature of 82 deg. F.

Reservoirs (Safety Provisions) Act.

H.M. Home Office announces that a second list of engineers appointed to each of the two panels of qualified civil engineers constituted for the purposes of the above Act appears in the *London and Edinburgh Gazettes* for February 6th. It includes and supersedes the previous list.

Parliamentary Notes.

(By Our Special Parliamentary Reporter.)

Telephone Instruments.

On February 2nd SIR NICHOLAS GRATTAN-DOYLE asked the Postmaster-General whether his department continued to order from the manufacturers telephone instruments of the old "candle-stick" pattern; whether such instruments were being installed when exchanges were re-equipped for automatic working; and why the newer and more efficient hand microtelephone was not being standardised for general use.

MR. H. LEES-SMITH said that as regarded efficiency, the "candlestick" pattern of telephone was in no way inferior to the new type, and was in fact standard both in this country and in the United States. The new type was more expensive both in initial cost and in maintenance charges, and was supplied to those subscribers who preferred it on grounds of convenience and were willing to pay a small supplementary charge to cover the additional costs. Supplies of both patterns were ordered as required.

Wireless Direction Finders.

On February 3rd MR. A. M. SAMUEL asked the President of the Board of Trade if he would state the increase in the number of wireless direction finders installed round the coasts of the British Isles for the use of shipping during the year 1930.

MR. W. GRAHAM said that there was no addition in 1930 to the seven wireless direction-finding stations on shore, giving bearings on request. The number of radio beacons from which ships fitted with direction finders could take bearings was increased during 1930 from 12 to 15. An additional beacon came into operation on January 1st, 1931, and five others were in course of construction. In addition, there was one rotating beacon at Orfordness, in Suffolk, from which ships fitted with ordinary radio-receiving apparatus could obtain bearings by the use of a stop watch.

Radio Loud-speakers.

Summary of the results of electrical impedance measurements of a moving-coil loud-speaker in a vacuum.

By P. K. TURNER, M.I.E.E.

(*Extracts from a paper read before the* WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE extraordinary difficulty of interpreting the results obtained by any measurements of the actual acoustic output of a loud-speaker is common knowledge. Pure analysis is not satisfactory; except at quite low frequencies, it persistently indicates that the ordinary moving-coil speaker cannot be useful at frequencies over, say, ω=5,000.* For example, C. R. Cosens has arrived at outputs of 0.07 watt for 30 watts input at low frequencies, and 0.06 micro-watt at 4,000 cycles per second, efficiencies of 0.25 per cent. at the best, and response curves 20 decibels down at 4,000 cycles per second.

Consideration of these and other difficulties led the author, in 1927, to the belief that the best line of attack was to check some of the fundamental data of the analysis by measurement, the measurement to consist in finding the input resistance and reactance of the instrument (at various frequencies between 40 and 6,000 cycles per second) under three conditions. First, with the coil firmly held, so that the impedance of the coil itself *in situ* could be found. Secondly, with the whole instrument in a vacuum chamber: this gives an impedance depending only on (*a*) the coil impedance already found, and (*b*) the mechanical impedance of the moving parts, which latter can then be computed. Thirdly, under normal conditions: in this case an acoustic impedance also is added and can, in turn, be computed by allowing for the impedances already found.

By analysis of the results one should be able not only to compute the "response" curve of the speaker, but also to show whether any deviations from the ideal arise from electrical, mechanical, or acoustic defects. This latter information can in no way be obtained from a directly-measured response curve.

Thanks to Messrs. Graham Amplion, Ltd., the author had a suitable vacuum chamber made and put it into use towards the end of 1929. The results of the investigation afford some indication why loud-speakers of the moving-coil type can be capable of a much better performance at high frequencies than would be expected from simple theory. They are presented, not so much for any intrinsic merit of their own (for they need confirmation by other workers) as because, in the author's opinion, they do indicate that this line of attack is a useful and powerful one.

Summarised, some of the more striking results are:—

(1) The inductance of the coil falls very considerably as the frequency goes up, eventually becoming less than its value for the coil in air. This is due, apparently, to the "short-circuited secondary" effect of eddy currents in the iron in its neighbourhood. At low frequencies the effective permeability is of the order of 2.

(2) The effective mass (both mechanical and acoustic) of the moving parts also falls off very considerably as the frequency rises. In this case the apparent mechanical mass decreases from 21 grammes to the neighbourhood of 10 grammes for a frequency as low as 800 cycles per second.

(3) The measured acoustic resistance does *not* fall off, and at all frequencies exceeds the theoretical radiation resistance of a rigid disk of the same diameter.

(4) Wave transmission down the cone becomes important at quite low frequencies, its effects being perceptible in this case at 300 cycles per second.

(5) At low frequencies, about three-quarters of the width of the "surround" appears to behave as if it were part of the cone.

The characteristics ascertained are used to re-compute the input impedance, and give good agreement with the original observations. The computation is extrapolated to obtain estimates of the output and efficiency at frequencies for which the actual observations do not give opportunity.

* ω=pulsatance (=$2\pi f$) radians per second.

Legal.

The Ennig Electric Light & Power Co., Ltd.

AN application was made at Hereford County Court last week for the re-instatement of the Ennig Electric Light and Power Co., Talgarth, to the Registrar-General's list of companies, so as to permit the distribution of £250 to the shareholders. It was stated that the company was formed in 1912 and carried on business until 1920, when it was sold to the Talgarth Electric Supply Co. The Ennig Company invested £200 in the purchase of shares in the Talgarth Company, but ceased to carry on business, and neglected to send in returns to the Registrar after December, 1921. The company was consequently struck off the Register. No dividend had been paid by the Talgarth Company, which had been taken over by the Shropshire, Worcestershire and Staffordshire Electric Power Co. The liquidator of the Talgarth Company now announced that there was £250 in respect of shares of the Ennig Company in the Talgarth Company, but the sum could not be handed over so long as the Ennig Company was not on the Register. The application was granted.

Aeonic Radio, Ltd.

MR. JUSTICE MAUGHAM, in the Companies Court on Monday last, heard the petitions by the Dubilier Condenser Co., Ltd., and Lionel H. Lemon & Co. for an order for the compulsory liquidation of Aeonic Radio, Ltd.

For the respondent company and the liquidator, Mr. EVERSHED said there had been a sale of the company's assets and undertaking to a new company, but difficulties had arisen in carrying out the sale. The liquidator had issued a summons with a view to the transfer of the assets to the new company, although that company had not fully complied with the sale agreement. He asked for 14 days' adjournment of the petition to consider evidence.

His Lordship assented.

Consumers' Goodwill in Calcutta.

Two letters appearing in a recent issue of the *Statesman*, the well-known Calcutta newspaper, indicate both the similarity and the difference between East and West in problems involved in cultivating the goodwill of consumers.

That a low lighting rate is as popular a cry among the uninformed in India as it is in Great Britain is clear from the demand of one councillor (who, incidentally, mentions that he will be "going away to jail shortly") that the Calcutta Electric Supply Corporation shall reduce the rate to the public to two annas per kWh.

The other correspondent refers to the ill-feeling on the part of the public caused by the refusal of the Supply Corporation "to blink the lights at a fixed hour in the evening and so give residents and its customers a chance to fix time, thus alleviating a constant irritation and inconvenience. The time gun is not only expensive, but it can only be of use to a small section of Calcutta citizens. A blink at, say, 9 p.m. would assist 99 per cent. of them and fully 70 per cent. are customers of the Supply Corporation. There need be no hesitation in affirming that the irritation caused by this churlish refusal has been greatly instrumental in fostering the municipal desire to be in a position of independence."

The "position of independence" referred to relates to a proposal that the Corporation shall take steps to generate electricity for municipal services instead of purchasing it from the company.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Spanish Brochures for South America.

One of the most frequently-repeated complaints against British manufacturers is that they expect their home publications to be adequate for the purposes of foreign customers. This general complaint is, of course, not true of all manufacturers even if it is of wide application. The forthcoming British Empire Trade Exhibition in Buenos Aires has given manufacturers an opportunity of showing that they are alive to the necessity for producing catalogues and descriptive matter in the vernacular of their customers, and we have received three excellent examples of publications of this character.

The first has been produced by the Buenos Aires subsidiary of the G.E.C.—the ANGLO-ARGENTINE GENERAL ELECTRIC CO., LTD. This has as a frontispiece a picture of Magnet House, Kingsway, and the "Prologo" is a brief history of the G.E.C. and an account of its wide scope in electrical production. Then follows illustrated descriptive matter upon the company's principal factories, and extended notice is given to the Witton, Fraser & Chalmers, Hammersmith, and other works. Special attention is devoted to the Illuminating Engineering Department, and the illustrations are very clear and representative.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., has prepared a very handsome brochure dealing with the activities of its Engineering Department entitled "Where Modern Electrical Distribution Equipment is Made." The text is in both English and Spanish, and the photogravure pictures include the head office, Holborn Viaduct, an aerial photograph of the company's Gravesend Works, and extensive views of the engineering shops. The penultimate page shows "Henley" distribution pillars in a variety of situations.

The third publication has been received from Messrs PETTERS, LTD., Yeovil. It is of a different character from the others, being a severely technical treatise on the company's Atomic Diesel engines. It is very clearly printed and profusely illustrated.

Hospital Funds.

The 31st annual meeting in connection with the Ericsson Employés' Hospital Fund took place on February 5th. Twenty grants, to the total amount of £551 were approved. The list included £200 for the Nottingham General Hospital and £155 for the "Ericsson Bed Fund." The hope was expressed at the meeting that the Bed Fund would be complete in a few months' time.

The "Siemens Magazine" for February (Siemens Bros. and Co., Ltd.) contains the annual report for 1930 of the Employés' Hospital, &c., Fund. This shows that £1,100 has been given to hospitals and £429 transferred to the Convalescent Homes Fund. The principal beneficiary was the Hospital Saturday Fund which received £500.

The Ex-Verity Association.

The first smoking concert of the "E.V.A." will be held at the Caxton Hall on February 26th. The secretary, Mr. W. M. Tribute, 229, Regent Street, W.1, offers to send details to all interested, particularly those who are qualified for membership of the Association, but who have not yet joined.

Battery Manufacture in Australia.

It is stated that Grosvenor Electric Batteries, Ltd., of London, has made preliminary arrangements for the establishment of a factory in Australia. The output is to comprise torch and wireless batteries and all types of dry cells. The Australian directors are Messrs. H. W. Gepp, T. W. Haynes and H. Hecht.

Visits of Overseas Trade Representatives.

The Department of Overseas Trade announces that Mr. F. W. Field, Senior Trade Commissioner in Canada, and Mr. S. G. Irving, Commercial Secretary at Rio de Janeiro, Brazil, are on visits to this country. Mr. Field will be available at the Department's offices at the British Industries Fair, Olympia, between February 16th and 20th and February 23rd to 27th, while Mr. Irving can be seen at the D.O.T. from February 23rd to 27th and he will afterwards visit the provinces. United Kingdom firms interested in trade with Canada or Brazil can obtain interviews by appointment. References 3081/1/30 (for Mr. Field) and 2111/1/30 (for Mr. Irving) should be quoted.

Wages in the Engineering Industry.

Last week the official report was issued of the meeting on January 30th between representatives of the Engineering Employers' Federation and the engineering trade unions. This shows that a grave view of the situation of the engineering industry was taken by the employers' spokesman, Sir Allan Smith. He said that although costs were already higher than in other countries the margin was being increased by continued reductions of wages, costs and selling prices by foreign competitors. The latter, moreover, were not hampered by such restrictive conditions as prevailed in this country. The industry as a finishing industry and an "unsheltered" one had to bear an enormous burden. The situation was desperate and if agreement could not be reached upon the proposals regarding wages and conditions which the employers had placed before the unions "the employers will be left no alternative but to take what steps they consider necessary."

Price Reductions.

The GENERAL ELECTRIC CO., LTD., informs us that the price of the "Gecophone" 2-V 50-Ah accumulator (solidified acid type), such as is used in the company's screen-grid-four portable sets, has been reduced.

Messrs. PAINTER BROS., LTD., Hereford, have reduced the prices of their "PB" light-steel poles.

Registered Electrical Contractors.

We have received from the secretary of the National Register of Electrical Installation Contractors (1, Lincoln's Inn Fields, W.C.2) a list of registered contractors as at December 1st, 1930. This is arranged geographically and the names are given in alphabetical order under each place-name. The total number of names given is 1,428. Up to December 1st last 2,024 applications for registration had been received; the difference between the two figures is accounted for by the withdrawal or refusal of applications, the cancellation of registration in certain cases, and the withdrawal of registered firms. The 1,428 registered contractors are found in 367 towns in the British Isles (including five towns in the Irish Free State). The greatest number of contractors are in the London area (175) and there are 97 in Manchester. In each of the following places there are twenty or more registered contractors:—Birmingham, Leeds, Liverpool, Glasgow, Bradford, Belfast, Newcastle-upon-Tyne, Hull, Cardiff, and Dublin. Thirteen other towns have ten or more registered contractors.

Applications from the following for registration were accepted by the Executive Committee of the National Register at its last meeting:—

Williams, S. H., North Harrow.
Inkster, R., & Co., Liverpool.
Jay, W., Westcliff-on-Sea.
Accumulator Charging Co., Hull.
Colin Wood & Co., Montrose.
Hawkins, C. M., & Son, Liverpool.
Smith, C. G., Wolverhampton.
Landray & Chapman, Birmingham.
Marr, J. J., & Co., Ltd., Liverpool.

At the same meeting two applications were withdrawn and five were declined.

A Visit to Henley's Works.

On Saturday, January 31st, a party of about 24 students from the Junior Technical School, Gravesend, with their principal, paid to visit to the Gravesend works of W. T. Henley's Telegraph Works Co., Ltd. Although the factory was not working at full pressure, due to the half-holiday, the visitors found much to interest and instruct them. The party was under the guidance of Mr. E. E. Judge, assistant works manager, and Mr. Atkinson, the superintendent on duty.

A Memorandum on Eastern Markets.

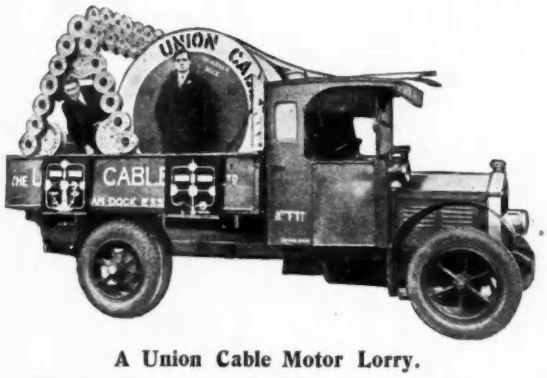
The Department of Overseas Trade has published a memorandum (No. C.3443) upon buying seasons for some of the principal goods imported into Turkey, Palestine, Syria, Iraq, Persia, and Hejaz and Nejd.

Unemployment.

There was an increase of 31,586 in the number of registered unemployed during the week ended February 2nd. At that date the total was 2,624,236, as compared with 2,592,650 on January 26th, and 1,508,598 on February 3rd, 1930.

Union Cable Lorry in a Procession.

The celebrations during Dagenham Civic Day, which was held recently, included a procession in aid of the Becontree Centre of King George's Hospital, in which the UNION CABLE CO., LTD., took part by entering two of its cable-lorries. The



A Union Cable Motor Lorry.

large cable drum, together with a number of small models, which were mounted on the lorries, attracted considerable interest. One of the lorries used is shown in the accompanying illustration.

Recent Contracts.

Several important overseas contracts have been received by the MORSE CHAIN CO., LTD., Letchworth, Herts., within the last week or two. These include two large orders from Germany, one from a Ceylon tea factory, one from the Egyptian State Railway workshops, and one from Russia. The last is for the supply of 91 chain drives for transmitting power from electric motors to lathes; it forms part of the recent £600,000 contract placed by the Russian authorities with Associated British Machine Tool Makers, Ltd.

Among recent orders of more than usual interest received by the HART ACCUMULATOR CO., LTD., is one for a battery consisting of 115 "STC" type 21-plate cells, having a capacity of 1,000 Ah, to be installed for emergency lighting purposes in Broadcasting House, the new headquarters of the British Broadcasting Corporation.

United States Electrical Exports.

The value of exports of electrical equipment from the United States during November last was $10,357,122—a decrease of $3,117,870 as compared with November, 1929. The total for the first eleven months of last year was $121,072,680, representing a decline of $15,844,015. The principal decreases during November occurred in the following items:—Telephone apparatus, from $733,730 to $235,183; transforming and converting apparatus, from $469,240 to $272,691; steam turbine generating sets, from $170,909 to $10,521; self-contained lighting outfits, from $113,706 to $47,893; transmission and distribution apparatus, from $696,775 to $594,705; motors, starters and controllers, from $1,550,118 to $960,252; motor-driven household devices, from $421,712 to $237,351; and insulated copper wire and cable, from $463,176 to $258,565. The principal customer, Canada, purchased goods to the value of $3,493,702. Mexico was second in the list with $789,196 and the United Kingdom third with $711,004.

The United States' imports of electrical equipment during November were valued at only $276,369, but this was nevertheless an advance of $79,204 upon the November, 1929, figure.

Book Notices.

The "A.E.G. Technischer Jahresbericht" for 1930 contains nearly 100 pages and deals with the progress made during the year by the company in its numerous activities. Details are given of the developments and improvements made in generating and distributing apparatus, and chapters are devoted to the application of electricity to various trades and industries. There is also an interesting section on electric traction. The publication is very well produced and contains numerous excellent illustrations.

Publications of the U.S.A. Bureau of Standards.—Research Paper No. 252, "Precision of Color Temperature. Measurements under various Observing Conditions; a new Color Comparator for Incandescent Lamps." Price 10 cents.

Miscellaneous Publication No. 117, "Units Used to Express the Wavelengths of Electromagnetic Waves." Price 5 cents

"Business Leadership," edited by Henry C. Metcalf, Ph.D. (Pp. 28+357). London: Sir Isaac Pitman and Sons, Ltd. Price 10s. 6d. net.—Twenty-two American writers contribute to this volume, which is stated in the preface to be the fifth which has been published under Dr. Metcalf's direction as records of annual courses of lectures in the Bureau of Personnel Administration on the general subject "Business Management as a Profession." The symposium includes contributions by biologists, psychologists, and educators as well as business executives and "management engineering" advisers.

"Spons' Electrical Pocket-book," by Walter H. Molesworth. Pp viii+401; fully illustrated. London: E. & F. N. Spon, Ltd. Price 6s. net.—The fourth edition of this useful little publication introduces several new subjects, including radiology and television. A thorough revision has been carried out and the whole volume has been brought up to date. In size this edition differs from its predecessors, and by change of paper and cover has become more suitable for carrying in the pocket.

The Faraday House Journal, Vol. XIV, No. 2, Lent Term, 1931.

The Mines Department has issued a preliminary statement of the number of deaths caused by accidents in and about mines and quarries of Great Britain during the year 1930. H.M. Stationery Office, price 1d. net, by post 1½d.

A Chinese Buying Commission in London.

Great Britain decided in 1922 that the balance of the British share of the Boxer Indemnity of 1901 should thenceforward be devoted to purposes mutually beneficial to China and the United Kingdom. The December *Journal* of the British Chamber of Commerce in Shanghai published the Chinese Government's proposals for dealing with the Indemnity. The bulk of the funds is to be applied to the creation of educational endowments. The next matter to be considered is the rehabilitation of the Chinese railways, preference being given to those which have been financed with British capital. All orders for material required from abroad will be placed in this country, and for this purpose it is proposed to transfer the funds to an Anglo-Chinese purchasing commission in London. The British Government has agreed to the proposals and a Bill to give effect to them has been introduced.

Local Exhibition.

The largest of the electrical exhibitions, a series of which are being held in the six town halls in the City of Stoke-on-Trent, was opened on February 2nd in Stoke by the chairman of the Electricity Committee, Alderman H. Leese. As in preceding exhibitions, a wide variety of domestic appliances, lighting fittings, furnaces and kilns, was displayed, while the City Electricity Department had three stands on which were exhibited electrically-driven machines, lighting fittings, small

Electrical Exhibition at Stoke.

portable tools, &c. The following companies had representative displays: General Electric Co., Ltd.; Huntbach & Co., Ltd.; Edison Swan Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Singer Sewing Machine Co., Ltd.; British Resistor Co., Ltd.; Resistance Furnace Co., Ltd.; Whittaker Bros.; Revo Electric Co., Ltd.; Ferranti, Ltd.; Credenda Conduits Co., Ltd.; Santon, Ltd.; Hoover, Ltd.; and Bulpitt and Sons, Ltd. A section of the exhibition is shown in the accompanying illustration.

The ex-B.W. Association.

The 13th annual dinner of the ex-British Westinghouse Association is to be held on Friday, March 13th, but the hon. secretary, Mr. L. S. Richardson, points out that members will only be unlucky if they go to the "Cecil," where the function has hitherto been held, instead of the "Trocadero," the venue of this year's dinner. Applications for tickets (and subscriptions) should be sent to the hon. treasurer, Mr. L. S. Hawes, 51, Fontenoy Road, Balham, S.W.12.

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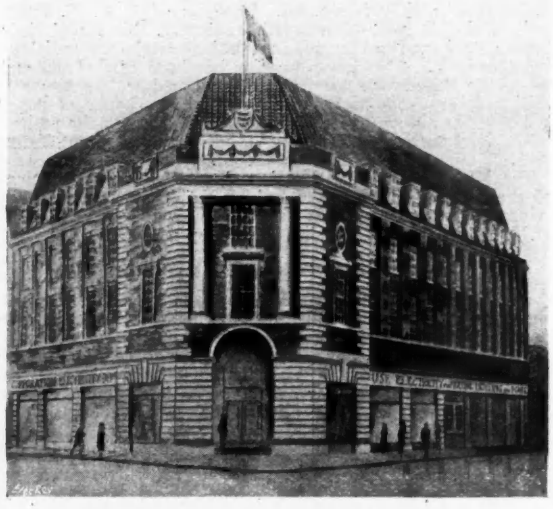
New Municipal Electricity Offices for Hull.

The rapid development of the domestic side of Hull's municipal electricity undertaking during the last eighteen months has rendered the present showrooms under the City Hall totally inadequate for the amount of business done, and application has consequently been made to the Electricity Commissioners for sanction to a loan required for the erection of large new premises which will accommodate both the new administrative offices and showrooms. The proposed new buildings,



Hull's Proposed New Electricity Offices.

a sketch of which appears in the accompanying illustration, are to be built on a corner site near the Paragon Station and will cost between £80,000 and £90,000, including the site.

Social Events.

One of the events of the electrical year is the annual staff dinner of the Osram-G.E.C. Lamp & Glass Works and M-O. Valve Works, and it is a testimony to the happy relations existing in the G.E.C. organisation that the same faces are seen year after year. This year's dinner was held at the Café Royal on Friday last week, and Mr. Chris. Wilson once again presided over his growing family. Sir Hugo Hirst, Bt., and a number of the directors of the G.E.C. were present, and evidently enjoyed the proceedings. After the loyal toast, Mr. A. Howe gave the toast of "The G.E.C.," making reference to the camaraderie existing between all ranks. Sir Hugo Hirst responded in an encouraging speech, and was accorded a rousing reception. The health of "The Visitors and Press" was proposed by Mr. W. Warren, who, as a works man, took the opportunity of "pulling the leg" of the Research Department to which Mr. C. C. Paterson O.B.E., president I.E.E., director of the Wembley Research Laboratories, later gave an adequate reply. The principal response to the toast was made by Mr. J. Farthing, of the G.E.C. Manchester branch. The ladies were represented in the toast list by Miss G. Reeves, who ably toasted the chairman, and Mr. Wilson made a brief acknowledgment. The dinner was succeeded by a dance, and in an interval an excellent cabaret show was provided by Gordon Marsh and his "Marshmallow Girls."

The executive staff of Messrs. E. K. Cole, Ltd., was entertained at dinner by the directors of the company on January 24th, at Mariani's Restaurant, London, and after dinner attended a performance of the "Song of the Drum" at Drury Lane Theatre. During the course of the dinner, Mr. W. E. Verrels, managing director, in a brief speech, expressed appreciation of the efforts of the executive staff which was largely responsible for the success of the past year's trading. After the theatre, the party returned to Mariani's Restaurant for refreshment, and then returned to Southend by coach.

The Magnet Rowing Club's second annual dinner took place on January 31st, at the Wembley Restaurant, Gerrard Street, W. Mr. T. Dyke was in the chair, and 30 members and guests were present. During the proceedings Mr. W. A. Wadey was presented with a suitable memento on the eve of his return to Australia to mark the members' appreciation of his services to the Club.

The Manchester "Magnet" Amateur Dramatic Society, consisting of members of the staff of the General Electric Co., Ltd., presented a comedy by Jevon Brandon-Thomas, "Passing Brompton Road," at the Lesser Free Trade Hall, Manchester, on February 5th. Miss Kathleen Wilson was excellent as Dultitia Sloane. She was admirably supported by Mr. C. Tower as her husband, Henry Sloane, Miss Veronica Godfrey as her daughter, Veronica Sloane, and Mr. J. Shapcott as her son, Eric Sloane. Variety was added to the scenes by Miss Edith Burrows as the maid (Privett), Miss Amy Hale as the eccentric but extremely entertaining Miss Pastel, Miss Mary Todd as Miss Carruthers, and Mr. Abbott as Mr. Montgomery, the lawyer. Mr. S. Middleton was not only the producer but took the part of George Harding with gusto. Great credit is also due to Mr. Booth, who acted as stage manager.

For Sale.

A number of second-hand d.c. motors are offered for sale by the Warrington Electricity Department.

The stock of Messrs. C. F. Young, Ltd., electrical factors, now in voluntary liquidation, is offered for sale by tender in small lots.

Tenders are invited by Stockport Electricity Department for the purchase of a 500/600-kW synchronous motor generator.

A quantity of electrical plant, including steam engines, dynamos, boilers, switchboard and batteries, is offered for disposal by Messrs. Lucas & Pyke.

(See our advertisement pages to-day.)

The Marking of Imported Compressors, &c.

The Standing Committee under the Merchandise Marks Act, 1926, recently held an inquiry into an application for an Order-in-Council requiring the marking with an indication of origin of imported air and gas compressors and exhausters, pneumatic tools and appliances, and parts thereof. The Committee's report has now been issued (Cmd. 3783, Stationery Office, price 2d. net). In this the case of the applicants is held to have been established so far as the complete articles are concerned, and the Committee recommends that this equipment should be required to bear an indication of origin at the time of sale or exposure for sale (not upon importation). The marking of parts is not recommended.

The E.D.A. February Window Display.

Reference was made in our last issue to the February programme of the Electrical Development Association, and the accompanying illustration shows the suggested window display for the month. As will be seen, a modernist note is struck by simple but effective methods, the "Three Modernist Men" again forming a prominent feature. The display is devoted to electric fires and artificial sunlight apparatus which create an atmosphere of warmth and light. The material required for dressing this window can be purchased, as usual, from the Association.

We have received a copy of the Electric Homes Campaign booklet entitled "Three Plug Points." This publication (16 pp.) is printed in green, black and grey, and contains 60 illustrations. It is intended for local distribution to the general public during the campaign and deals in a popular style with the advantages of additional plug points and the many uses of electricity in the home. An order form giving the prices for various quantities of these booklets can be obtained from the Association.

The E.D.A. February Display.

Enlightenment in Darkest Africa.

The following letter received by the British Electrical Development Association from Lagos appears to indicate that E.D.A.'s influence is of a far-flung nature :—

Dear Sir or Madam,—I have pleasure in acknowledging you that I found your name in some of people, that you have got Electrical sample catalogue for your Department, and if you will kindly enough as to send me before four weeks time because am required for it very soon, although I prepare to build my house now so for all my family want me to puting electrical on it, I shall be very pleased if this my request is granted by you.

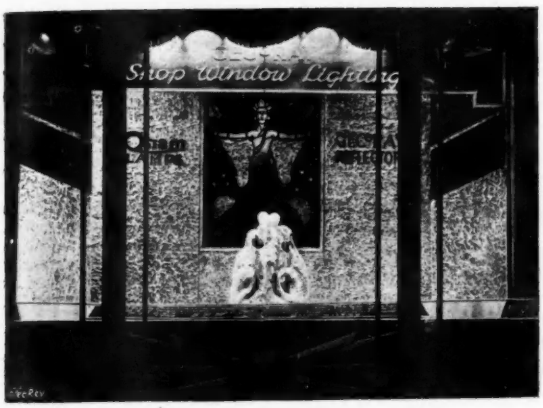
I am waiting for your favourable reply,

I am, Your faithfully customers.

"Put electrical on it" should prove a suitable equivalent to "Do it electrically" in West African propaganda if E.D.A. is ever called upon for such matter.

Colour Lighting in Shop Window Display.

A novel and effective use of colour lighting is being made by the GENERAL ELECTRIC CO., LTD., in one of its show-windows at Magnet House, Kingsway, W.C. The display has for a background a surface of crinkled tinfoil with a simulated stained glass window as a centre panel. In the middle of the window floor space is a small revolving structure on which



A G.E.C. Window Lighting Display.

"Gecoray" reflectors are mounted, and this structure is flanked by two geometrical designs, also covered by tinfoil for reflective purposes. By means of a battery of floodlights and reflectors, equipped with Osram lamps and different colour screens, the setting is given a continuously moving kaleidoscopic effect as a result of a constantly changing combination of colour lighting operated by automatic flashing devices. The general layout of the window can be seen in the accompanying illustration.

The A.E.G. to Reduce Wages and Hours.

The Berlin correspondent of the *Financial Times* reports that on February 16th the Allgemeine Elektricitäts Gesellschaft is to effect a 15 per cent. curtailment of the hours of work and salaries of its officials, in accordance with the agreement arrived at some time ago between the Association of Berlin Metal Industrialists and the employés' organisation. This is being done in order to obviate further discharges. The factories will work for five days in the week, while the central offices will continue work on six days, but with correspondingly shorter hours.

Bankruptcy Proceedings.

W. P. BARNELL, 25a, Sheep Street, Northampton, electrical engineer.—This debtor appeared at the County Hall, Northampton, recently for his public examination, and produced a statement of affairs which showed ranking liabilities of £630 and net assets of £151, leaving a deficiency of £479. He stated that he commenced business in 1918 with a capital of £10, and later entered into partnership. In 1928 the business was turned into a limited company, with a capital of £2,500, but a previous loan of £300 was not taken over by the company. The debtor was appointed managing director, and he held this position until October last. He proposed to sell his shares in the company and commence business on his own account. The company, however, would not buy his shares, and he commenced business on his own account in December without capital. By January this year he owed a considerable amount of money. The examination was adjourned.

The first meeting of creditors was held on February 3rd, when the case, being a summary one, was left in the hands of the Official Receiver, 6, The Parade, Northampton, as trustee.

A. C. E. APPLIN, 110, St. Mary's Road, Southampton, electrical engineer, trading as "Applin & Burt."—The receiving order herein was made on January 16th on the debtor's own petition, and according to the statement of affairs filed there are liabilities of £1,061 against net assets of £215, leaving a deficiency of £846. The debtor said his failure was due to taking over the deficiency of a partnership business; depression in trade; and competition. He commenced trading in 1926 and in 1929 entered into partnership with another who carried on a similar business. A loss of £150 was incurred last year and the partnership was dissolved. The debtor took over the assets and liabilities. The debtor's father increased his guarantee for a bank overdraft from £100 to £500 and in addition advanced sums amounting to £200.

S. NICHOLS (Electrical, Wireless & Gramophone Supply Co.), electrical engineer, 151, Marlowes, Hemel Hempstead.—Receiving order made February 2nd on debtor's own petition.

E. P. STURGEON, electrical engineer, 88, Northgate, Hartlepool.—Trustee, Mr. T. A. Stoker, 71, Albion Street, Leeds, appointed February 2nd.

H. GARTSIDE (H. Taylor & Co.), electrician and wireless dealer, The Arcade, Waterfoot.—First and final dividend of 2s. 6d. in the £1, payable February 16th at the Official Receiver's offices, Byrom Street, Manchester.

G. G. GRIEVE, 57, Diana Street, Cardiff, lately trading with another at 14, West Bute Street, as "The Up-to-Date Electrical and Mechanical Engineers," 236, Bute Street, Cardiff.—This debtor's discharge was granted on February 3rd, subject to two months' suspension.

J. DAVIES (Davies & Co.), wholesale radio and gramophone factor, 5, Russell Street, Park Row, Leeds.—First meeting held February 12th at the Official Receiver's office, 24, Bond Street, Leeds. Public examination, March 3rd, at the County Court House, Albion Place, Leeds.

R. E. YOUNG, wireless and electrical engineer, 8, Manchester Road, Swindon.—First and final dividend of 3s. 8d. in the £, payable February 16th at the Official Receiver's offices, 38, Regent Circus, Swindon.

Company Liquidations.

COWELL, WYATT & CO., LTD., radio and electrical engineers, 47, Abington Street, Northampton.—A meeting of creditors was held recently at the offices of Messrs. A. C. Palmer and Co., Kingham Chambers, Abingdon Street, Northampton. Mr. C. R. Eecke, chairman of the company, presided. The statement of affairs showed ranking liabilities of £3,207, including trade creditors for £1,404. The net assets were estimated at £370, leaving a deficiency so far as the creditors were concerned of £2,831. The company was registered in 1926 for the purpose of taking over a business which had previously been carried on by Mr. A. Lee under the style of Cowell, Wyatt & Co. The assets acquired by the company were valued at £1,249, and the vendor received 500 £1 shares and £749 in cash. The company had never made any profit, and the directors had received no fees. The chairman stated that the company's position had been brought about by unfair competition and price-cutting. The directors of the company, who were cash creditors, were withdrawing their claims. A resolution was passed confirming the voluntary liquidation of the company, with Mr. H. C. Palmer as liquidator, and a committee of three of the creditors was also appointed.

MASON'S SHOPS, LTD., wireless dealers, 87, Bishopsgate, E.C., and at Bristol, Leeds, Portsmouth, Liverpool and Manchester.—The statutory meeting of the above was held on February 2nd, at the offices of the company, Bishopsgate, London, E.C. The chair was occupied by one of the directors of the company, who reported that the liabilities totalled £3,949, and the assets £350. The company was formed last year to acquire a chain of shops carrying on business in the provinces. Recently, however, only three of the shops remained opened, namely those at Bristol, Leeds and Portsmouth. The issued capital was £3,000. Resolutions had been passed for voluntary liquidation, with Mr. C. Latham, of the Radio and Gramophone Trades Guardian Association, 78, New Oxford Street, W.C., as liquidator. Mr. Latham's appointment was confirmed, and a committee was elected.

BRUNSWICK ENGINEERING CO. (1927), LTD., electrical engineers, 9, Brunswick Place, City Road, E.C.1.—At a meeting of the creditors on February 2nd at the offices of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., a statement of affairs was submitted showing liabilities of £3,073, of which £1,265 was due to trade creditors. The net assets were £770, leaving a deficiency as regarded creditors of £2,303. The company was formed in 1927 with a nominal capital of £450, all of which was issued for cash. It purchased an existing business for £550. At November 30th, 1930, there was an accumulated loss of £2,496 on trading. Mr. W. A. J. Osborne was appointed liquidator of the company, with a committee of inspection.

RAMSBOTTOM ELECTRICAL HEATING & LIGHTING CO., LTD.—Meeting to receive an account of the winding up, March 10th, at Tower Chambers, 29, Brown Street, Manchester.

COUNTY ELECTRICAL & WIRELESS STORES, LTD.—Last day for receiving proofs for dividend, February 21st. Liquidator, Mr. G. D. Pepys, Senior Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, W.C.2.

BATCHELOR & SON, LTD.—Winding up voluntarily. Liquidator, Mr. R. O. White, 9-10, King Street, Cheapside, E.C.

EDWARDS & SONS, LTD.—Winding up voluntarily. Liquidator, Mr. A. Mair, 34, Palace Court, London, W.

MALAY & EASTERN POWER DEVELOPMENT CO., LTD.—Meeting at 3, Central Buildings, Westminster, S.W., on March 5th to receive an account of the winding up of the company. Particulars of claims by February 16th to the liquidator at the above address.

Private Arrangements.

W. E. WOOLDRIDGE, 16, Market Place, Devizes, electrical engineers, &c.—At a meeting of creditors a statement of affairs was presented showing liabilities of £1,875 and assets estimated to realise £2,550, leaving a surplus of £675. The opinion was expressed that it should be possible to sell the business as a going concern, and a resolution was passed in favour of a deed of assignment being executed to Mr. Arthur Collins, 28, Baldwin Street, Bristol. A committee was also nominated.

F. F. SPEARING & Co., electrical engineers, 7, Dumfries Place, Weston-super-Mare.—At a recent meeting of creditors it was reported that the liabilities were £333, all due to the trade, while the net assets were £64, leaving a deficiency of £269. The business was commenced in 1925 with a capital of £145. A full set of books had not been kept, but so far as could be ascertained, the business had been losing money for some time past. The drawings had been small. It was decided that the matter should be dealt with under a deed of assignment to Mr. A. Collins (Messrs. E. T. Collins & Son), 28, Baldwin Street, Bristol.

Winding-up Petition.

GEORGE HARRISON & SON, LTD.—A petition for the winding up of this company has been presented to the High Court by George Isaacs & Co., 2, Well Street, Aldersgate, E.C., and will be heard in London on February 16th.

A Commercial Guide to Argentina.

The latest of the Department of Overseas Trade's "Hints for Commercial Visitors" deals with Argentina and is therefore very opportune. The British Empire Trade Exhibition in Buenos Aires opens on the 14th of next month and intending visitors should find the publication (Ref. No. C.3451) of considerable service. The "Hints," which have been prepared by the Commercial Counsellor at the British Embassy, Buenos Aires, commence with some notes on climatic conditions, and proceed to give attention to such matters as passports, steamship services, Customs regulations, hotel accommodation and charges, travelling and communications. The leading characteristics of a number of the principal cities are briefly set out.

In this connection we may refer to some notes received from the London office of the British Empire Trade Exhibition, 5, Parliament Mansions, Victoria Street, S.W.1. Intending visitors to Argentina are reminded that the weather in Buenos Aires in March and April is generally comparable to English summer weather, and similar clothing should, therefore, be taken. The vaccination regulations usually enforced will be waived for visitors to the Exhibition travelling first and second class or by tourist ship. Special arrangements have been made by the Exhibition authorities to procure the introduction free of duty of samples and propaganda materials and literature provided these are intended solely for use or distribution at the Exhibition. Advance hotel bookings are said to be heavy, and visitors are advised to make their arrangements in this connection as quickly as possible.

New Catalogues and Lists.

HIGGS MOTORS, Witton, Birmingham.—The February stock list of "Higgs" motors.

BURNHAM & Co., Deptford, London, S.E.8.—A leaflet relating to signs and the "Burnham" sign service.

BLACKSTONE & Co., LTD., Stamford.—A leaflet dealing with the "Blackstone" high-speed "Spring Injection" crude oil engines for lorries, 'buses, tractors, marine and stationary uses.

SOAPSTONE PRODUCTS Co., 6, Holborn Viaduct, London, E.C.1.—An illustrated booklet describing "Soapstone" electric radiators.

W. CANNING & Co., LTD., 133-137, Great Hampton Street, Birmingham.—An interesting booklet on the subject of rust prevention by means of cadmium plating.

JOHN A. H. HUNT, LTD., 233, Bradford Street, Birmingham.—A folder illustrating a number of attractive types of modern lighting fittings.

M. W. WOODS, LTD., 46, Kingsway, London, W.C.2.—Catalogue M.231, describing "Woods'" polishing, buffing or grinding motors.

JOHN SHAW & SONS, WOLVERHAMPTON, LTD., Wolverhampton.—A 44-page illustrated catalogue of "Governor," "Trojan," and "Crescent" electrical appliances. Supplies of these catalogues can be obtained on which the company's name does not appear, a space being left blank on the cover for the retailer's name to be printed in.

RADIO INSTRUMENTS, LTD., Purley Way, Croydon.—A catalogue containing details of a number of new lines, including a general purpose output filter choke, a power grid choke with nickel-iron core, mains and general purpose transformers, and a dual range coil.

L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, London, W.C.2.—Leaflets relating to "Directolite" fittings for store lighting and "Pye Twintriple" portable radio receivers. Also the January issue of "The Link."

E. K. COLE, LTD., "Ekco" Works, Southend-on-Sea.—A folder containing a personal message from the company's managing director with regard to "Ekco's" plans for the future.

The HOTPOINT ELECTRIC APPLIANCE Co., LTD., 24, Newman Street, Oxford Street, London, W.1.—A booklet entitled "Better Methods of Home Laundering" detailing the merits of the "Hotpoint-Maytag" electric washing machines.

The COUNTY OF LONDON ELECTRIC SUPPLY Co., LTD., County House, 46/47, New Broad Street, London, E.C.2.—A striking bookmark suggesting some of the advantages of electricity.

BERRY'S ELECTRIC, LTD., 85-86, Newman Street, Oxford Street, London, W.1.—A well-produced publication, illustrating and describing the company's automatic electric water heaters.

J. SHAW, SON & GREENHALGH, LTD., Albert Works, Huddersfield.—A folder giving particulars of "Shaw's" high pressure valves and boiler mountings.

MEECH ELECTRIC DRIVES, LTD., 19-20-21, Farringdon Street, London, E.C.4.—Leaflet No. 151, describing the company's electrical installation at the new printing offices of *Punch*.

S. O. BOWKER, LTD., 20, Branston Street, Birmingham.—An illustrated catalogue relating to the "Tenby" wiring system.

CARRON COMPANY, Carron, Falkirk.—A pamphlet illustrating the new "Blake" electric fire.

The IGRANIC ELECTRIC Co., LTD., 149, Queen Victoria Street, London, E.C.4.—A booklet entitled "The Elimination of Pong" relating to anti-phonic radio valve holders. Also Pub. S.5120 which contains a reprint from the *Daily Express* describing the use of electrical reproducing equipment in a mission hall.

The BENJAMIN ELECTRIC, LTD., Tariff Road, Tottenham, London, N.17.—A useful booklet containing helpful "prescriptions" for the installation of lighting in various kinds of shops.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—Leaflet P.256, giving details of "B.I." ironclad switches and switch cut-outs.

T. C. JONES & Co., LTD., 93-95, Wood Lane, London, W.12.—A pocket edition catalogue (220 pp.) of contractors' tools and equipment. Among items of note is the "Burnside" electric surfacing machine for grinding and polishing terrazzo and marble floors.

The BRITISH THOMSON-HOUSTON Co., LTD., Rugby.—A large quantity of literature dealing with a.c. brake magnets, d.c. motor control panels, air-break auto-transformer starters, mining plug distribution boxes, mining self-contained a.c. controllers, metal-clad switchgear, isolators, ironclad oil-immersed circuit breakers, protective panels for crane motors, air-break switches and circuit-breakers, motor generators, alternators, power factor correction motors, induction motors, and large high-pressure type steam turbines.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, London, S.W.1.—The February stock list of electric motors, transformers, circuit-breakers, &c.

The Timber Market.

Our Timber Trade Correspondent reports that the demand for general building woods has not been brisk over the past month, but these woods are expected to be cheap throughout the year, and it is hoped that consumption will be stimulated. The hardwood trade continues slow. Mahogany logs are difficult to firm up in value to give shippers a fair return, and teak and the fancy woods are in poor request but firmly held. American woods are plentiful and cheap. High-class merchants hold supplies of Empire woods at reasonable values Plywood in its many qualities and thicknesses is in large stock throughout the country.

Trade Announcements.

A merger has been arranged between the AEROGRAPH Co., LTD., 43, Holborn Viaduct, E.C.1, and the DE VILBISS Co., LTD., West Drayton, Middlesex. Under this arrangement, the Aerograph Co., in addition to continuing the manufacture and sale of "Aerograph" equipment, will also become sole distributors of DeVilbiss equipment in the United Kingdom and the Irish Free State as from March 2nd. As we reported in our last issue, the company is erecting a new factory at Lower Sydenham, and DeVilbiss service stations will be established at the existing provincial branch offices and demonstration centres of the Aerograph Co.

Messrs. GIBBONS BROS., LTD., Dibdale Works, Dudley, in conjunction with WILD-BARFIELD ELECTRIC FURNACES, LTD., North Road, Holloway, N.7, have acquired from Messrs. Rudge-Whitworth, Ltd., Birmingham, as from February 1st, the sole manufacturing and selling rights of "Eternite" carburising compound. In connection with this, and with the manufacture and sale of mechanically-operated furnaces (under agreement with the Hevi Duty Electric Co., Milwaukee, U.S.A.) Messrs. Gibbons and Wild-Barfield Electric Furnaces are forming a new company—G.W.B. Electric Furnaces, Ltd.—the whole of the share capital of which will be held by the firms named.

The NORTHERN ELECTRICAL & VENTILATING Co., LTD., has removed to 59-67, Old Hall Street, Liverpool. (Telephone: Central 60; telegrams: "Purchase, Liverpool.")

On March 1st, INTERNATIONAL COMBUSTION, LTD., the UNDERFEED STOKER Co., LTD., and COMBUSTION STEAM GENERATOR, LTD., will move from their present offices to Aldwych House, Aldwych, W.C.2.

The telephone number of the Newcastle branch of the SUN ELECTRICAL Co., LTD., has been altered to Newcastle 20525.

The telephone number of FRANCIS LAMP LOCKS, LTD., has been changed to Whitehall 8827 and 8828.

The Newcastle branch of the FOSTER ENGINEERING Co., LTD., has been removed to 9, Eldon Square, Newcastle-upon-Tyne. The telephone numbers are at present unaltered.

The name of Marco Refrigerators (1929), Ltd., has been changed to MARCO REFRIGERATORS, LTD.

Employés' Representation on the North-West Midlands J.E.A.

The Minister of Labour announces that as soon as possible after February 23rd she will designate to the North-West Midlands Joint Electricity Authority, in accordance with the North-West Midlands Electricity District Order, 1928, the employés' organisations having members in the employment of authorised undertakers in the District, in order that the organisations so designated may choose a representative to be a member of the Joint Authority. Any employés' organisation which is desirous of being considered by the Minister for designation should make application in writing to the Minister not later than February 21st, 1931, on a form which may be obtained from the Secretary, Ministry of Labour, Montagu House, Whitehall, S.W.1.

Prices of Materials.

Messrs. Edward Till & Co. report, February 10th: India-rubber, Para fine: 5d., ¼d. dec.

Messrs. James & Shakespeare report, February 10th: Copper bars, best selected, sheet and rod: No change.

English pig lead: £15, 15s. inc.

Messrs. James Forster & Co., in their letter dated January 7th, said that there was no important improvement in the position of the lead market last week. A fair demand was met with from home consumers, but there is no evidence of increased consumption. Supplies are full and stocks continue to increase. The only remedy to the present state of affairs is a curtailment of production, as it seems unlikely that consumption will increase yet awhile. Otherwise prices will tend inevitably to a lower level.

Lighting and Power Notes.

Aberdeen. — LOANS SANCTIONED. — The Corporation has received sanction to the borrowing of £19,751 for mains extensions, and £7,900 for a d.c. house set at the Ferryhill generating station.

Barrow-in-Furness.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £7,500 for the provision of domestic apparatus for hiring purposes.

OVERHEAD LINES—The Ministry of Transport has consented to the erection of overhead lines in the parish of Meathop and Ulpha.

Batley.—BULK SUPPLY AGREEMENT.—The Yorkshire Electric Power Co. has agreed to continue to give a bulk supply to Batley on the terms of the old agreement, subject to one or two modifications.

Beckenham.—LOAN.—The Urban District Council Electricity Committee recommends that application be made for sanction to the borrowing of £25,000 for mains and services.

Billingham.—STREET LIGHTING.—The Urban District Council Highways Committee has had under consideration a scheme for the lighting of streets in the town by electricity, and has instructed the surveyor to prepare estimates.

Birkenhead.—CHANGE-OVER.—The Corporation Electricity Committee has obtained sanction to the borrowing of £10,100 for the purposes of the change-over of the supply system in Grange Road and Cavendish Drive districts.

Blackburn.—SUPPLY TO COLLIERIES.—The Town Council has approved the supply of electricity to Messrs. Pickup's collieries at Rishton.

Bridlington.—NEW ELECTRICITY CHARGES.—The Town Council has adopted the following new tariff for electricity: General lighting: Up to 500 kWh per quarter, 6d. per kWh; 500 to 1,000 kWh, 5½d.; 1,000 to 1,500 kWh, 5¼d.; exceeding 1,500 kWh per quarter, 4¾d.; exceeding 10,000 kWh per annum, 4½d. Kinemas: 3d. per kWh. Outside signs and illuminations: 4d. per kWh. Power or heating: Up to 100 kWh per quarter, 4d. per kWh; 100 to 250 kWh, 3d.; 250 to 500 kWh, 2½d.; 500 to 1,000 kWh, 2¼d.; exceeding 1,000 kWh, 1¾d.; exceeding 10,000 kWh, 1½d. Cooking and heating, when only coal or electricity is used for cooking: 1d. per kWh, with a minimum charge of 7s. 6d. per quarter, excluding meter rent.

Bristol.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to make application for sanction to a loan of £200,000 for mains extensions.

Burton-on-Trent.—EXTENSIONS.—The Corporation Electricity Committee recommends extending mains to give a supply of electricity to Linton, Ooton in the Elms, Lullington, Rosliston, Walton, Rangemore, Callingwood, Needwood, and Hanbury, at a cost of £20,000.

LOAN.—The Committee is applying for sanction to a loan of £50,000 for mains and services.

Bury.—STREET LIGHTING.—The Corporation Fire Brigade and Lighting Committee has instructed the Electricity Department to carry out the lighting of the streets on the Spring No. 1 housing estate by means of electricity.

Canada.—ELECTRICAL DEVELOPMENT IN ALBERTA.—Surveys will be begun in the spring at a power site on the Athabasca River, where the Calgary Power Company contemplates the ultimate construction of a dam and power house costing £1,000,000. The site is approximately 150 miles from Edmonton at a point on the Athabaska River, north-west of the town of Edson, and about six miles from the spot at which the Edson-Grande Prairie trail crosses the river.

Chester.—NEW SUB-STATION.—It is intended to build a new sub-station at the Dingle, and sanction has been obtained to spend £2,231 on the provision of the necessary equipment and £777 on the building.

Continental.—ITALY.—With regard to the compulsory reduction of 10 per cent. in electricity charges electricity undertakers in Italy assert that the price of electricity for lighting is three times what it was in 1914, and that the big increase is mainly due to State or municipal taxation of electricity for illumination. While December showed a decline in production of 3.7 per cent., the total for the whole of 1930, amounting to 9,930 million kWh, showed an increase of 184 million kWh or 1.9 per cent. on 1929.—*Reuter's Trade Service* (Milan).

GERMANY.—The industrial depression is still making itself felt in a reduced demand for electricity in Germany. During November last the output of 122 principal electric supply undertakings in the country amounted to 1,398,600,000 kWh, bringing up the total for the first eleven months of 1930 to 14,790,900,000 kWh, as compared with 15,320,800,000 kWh in the corresponding period of 1929.

SPAIN.—The demand for electricity in the Seville district is steadily growing, the output of the power stations of the Société Sevillane d'Electricité during the past year amounting to approximately 140 million kWh, as compared with only 124 million kWh in 1929. The company has recently extended its distribution network to the Badajoz and Huelva districts and has also acquired the electricity undertakings at Merida and Badajoz.

SWITZERLAND.—The municipal authorities of Schaffhausen and the North Switzerland Power Co. have jointly applied to the Swiss Government for a concession to establish a new hydro-electric station on the Rhine, near Diessenhofen.

FINLAND. — In view of the forest resources of the country, special attention is being devoted to the use of wooden poles for high-voltage transmission lines. In the course of a recent paper M. Karl Stromberg described the masts used in connection with a 70,000-V line near Helsingfors, which passes across a gulf in which are many small islands, the longest span being about 570 yards. The poles are used in pairs, set at an angle and connected to each other by a steel cross-member on which the insulators are supported. For the span in question, poles 150 ft. in height are used, they being connected by a carrier cable from which the electric cable is supported by insulator chains, the ends of the carrier cable passing over grooved pulleys to balance weights which maintain the necessary tension.

Dartford.—EXTENSIONS.—The Urban District Council is to extend mains and provide a transformer sub-station in St. Vincents Road at a cost of £10,000.

East Ham.—CABLE EXTENSIONS.—The Corporation Electricity Committee has received sanction to a loan of £5,494 for the extension of the feeder cable from the generating station to Charlemont Road housing estate and the Isolation Hospital.

Formby.—BULK SUPPLY.—The Urban District Council is taking steps to cancel the existing arrangement with the railway company, which expires in July, 1934, for a supply of electricity in bulk, as new terms for a new ten years' agreement are not acceptable. Negotiations are to be opened up with the Lancashire Electric Power Co. for a bulk supply in the event of the railway company agreeing to the cancellation of the existing agreement.

EXTENSIONS.—Owing to the increasing demand for electricity the Electricity Committee has decided to lay new l.p. feeders and to purchase a third single-phase 50-kVA transformer.

Gillingham (Kent).—LOANS.—The Town Council is to make application for sanction to loans of £10,000 for mains and services, and £2,000 for the provision of sub-stations.

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of distributing mains at a cost of £13,572.

CHANGE-OVER.—The Electricity Committee has instructed the manager of the Electricity Department to proceed with the general preliminaries in connection with the change of frequency in the eastern district of the city (No. 4 area).

Great Yarmouth.—NEW GENERATING PLANT.—The Town Council is applying for permission to spend £35,000 on generating plant.

Guildford.—OVERHEAD LINES.—The Ministry of Transport has informed the Rural District Council of its consent to the placing of overhead lines between Guildford and Godalming, on the application of the Central Electricity Board.

Haslingden.—LOANS.—The Corporation Electricity Committee is applying for sanction to loans of £10,000 for mains and £3,000 for sub-station equipment.

Japan.—NEW POWER STATION.—The erection of another thermal power station, with a capacity of 10,000 kW, is being considered by the Formosan Electric Power Company.

Lancaster.—SUPPLY TO RURAL DISTRICT.—Supplies of electricity from the Corporation's electricity works were recently switched on to West Bank, Slyne, and Bolton-le-Sands.

Leek.—SUPPLY TO CHEDDLETON.—The Urban Disrict Council is to apply to the Electricity Commissioners for a Special Order authorising it to supply electricity in parts of the parishes of Lowe and Cheddleton which are not already included in its area of supply. Sanction to a loan of £2,698 for the cables, &c., required is also to be applied for.

Leyton.—CHANGE-OVER.—The Town Council has applied for sanction to a loan of £72,450, the estimated cost of the change-over from d.c. to a.c., in the Dawlish Road and Essex Road areas.

Liverpool.—EXTENSIONS.—Negotiations have been taking place between the Corporation Electricity Committee and the West Lancashire Rural District Council, the supply authority for the parishes of Maghull, Lydiate and Aughton, with a view to the Liverpool Corporation taking over all the liabilities and assets of the undertaking and supplying the townships named with electricity at the same rate as the out-districts of Liverpool.

London.—HACKNEY.—The Borough Council Electricity Committee recommends the expenditure of £48,330 on sub-station extensions and e.h.p. and l.p. cable work.

Lothians.—ELECTRICITY SUPPLY PROGRESS.—During the past few months the activities of the Lothians Electric Power Co. have been concentrated on supplying the southern parts of Midlothian, and Gorebridge and Newtongrange have now been linked up. The company is now considering the extension of the supply from the Penicuik section to the West Linton area.

Manchester.—PROGRESS DURING DECEMBER.—During the month of December the Corporation Electricity Department showed an increase of 2,956 kW in connections, bringing the total up to 446,326 kW. Applications received for supplies, including additional supplies, amounted to 1,118, representing a total of 2,461 kW. The number of hired cookers connected increased by 147 making a total of 7,126 now on circuit. Applications for the hire of cookers numbered 113. Two new sub-stations were put into commission and new plant was installed in four existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 13,399 consumers up to December 31st, while work was in progress involving 1,442 consumers.

LOAN.—The Electricity Committee is to apply for sanction to a loan of £200,000 for distributor mains.

Plymouth.—BULK SUPPLY.—The Corporation Electricity Committee has received an application from Messrs. Christy Bros. & Co., Ltd., Chelmsford, for a bulk supply for the purpose of distribution in the Okehampton and Tavistock areas by a company to be known as the West Devon Electric Supply Co., Ltd. The matter has been referred to the engineer for negotiation and report.

HEATING OF HOSPITAL.—The Corporation Health Committee is considering a scheme for electric tubular heating and radiator heating in the hospital at an estimated cost of £425.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

ABERTILLERY.—Lighting: From 7d. to 6d. per kWh.

CROYDON.—Lighting flat rate: From 6½d. to 6d. per kWh.

WIMBLEDON.—Domestic power (where electric cookers are installed) for the December and March quarters: From 1d. to ½d. per kWh for the first 360 kWh consumed in each of these quarters.

Salford.—CHANGE-OVER.—The Corporation Electricity Committee has decided to accelerate the five years' plan for the change of the system of supply from d.c. to a.c. so that it will be completed within two years. The Unemployment Grants Committee has intimated its willingness to approve, for grant purposes, expenditure up to £20,000 in excess of the normal expenditure of £7,200 in respect of additional work to be carried out within the next two years.

Sheffield. — SWITCHGEAR ALTERATIONS. — The Corporation Electricity Committee has received sanction to the borrowing of £16,000 for alterations and additions to the main switchgear in Neepsend and Blackburn Meadows generating stations.

Smethwick.—ELECTRIC HEATING OF SCHOOLS.—The Corporation Education Committee reports that it has arranged for an experiment in electric heating of schoolrooms to be carried out at the Cape Boys' School. Four firms are participating in the experiment.

Special Orders.—The Shropshire, Worcestershire & Staffordshire Electric Power Co. has applied to the Electricity Commissioners for a Special Order authorising it to raise additional capital.

The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them dissolving the South-East Lancashire Electricity Advisory Board.

Stockport.—ALL-ELECTRIC HOUSE EXPERIMENT.—The Corporation Housing Committee has been recommended to equip a number of houses to be built on the Knypersley Avenue estate with an all-electric service. The results obtained are to be compared with those obtained from other houses where the dual system of gas and electricity is in operation.

Tunbridge Wells.—LOANS.—The Town Council has applied for sanction to loans of £20,113 for connecting up 2,000 consumers under the hire-purchase wiring scheme, and £12,583 for the extension of the h.p. system and the provision of sub-stations.

Tynemouth.—YEAR'S WORKING.—We have received from Mr. C. Turnbull, borough electrical engineer, a copy of his annual report on the working of the electricity undertaking during the year ended March 31st last. The total revenue increased from £64,304 to £67,745, while the working expenses amounted to £44,371, as compared with £39,323 in the preceding year. The gross profit declined from £24,981 to £23,374. After making provision for capital and other charges, there was a net surplus of £5,555 (of which £2,036 was allocated as an additional contribution to the rates), which compares with £8,748 in the previous year. The capital expenditure during the year amounted to £9,758, bringing the total now spent on the undertaking to £256,093. Sales of electricity increased from 8,212,704 to 8,819,394 kWh (supply through Corporation mains from 5,414,880 to 6,085,053 kWh). During the year 620 new installations were completed under the assisted-wiring scheme, and the number of applications for further installations continues to grow. Out of a total expenditure of £20,083 on assisted wiring the sum of £4,709 has been repaid. The hire and hire-purchase of apparatus is also developing at an increasing rate, electric irons in particular being very popular. Arrangements have now been completed for changing the frequency of the supply from forty to fifty cycles.

Wakefield.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £25,000 for mains and services.

Walsall.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £51,000 required for the electricity undertaking.

Warrington.—SUPPLY TO CUERDLEY.—The Rural District Council has approved of the application being made to the Electricity Commissioners by the Warrington Corporation for a Special Order empowering the Corporation to supply electricity for lighting and other purposes in the parish of Cuerdley, and in that part of the parish of Burtonwood which is not included in the supply area of the St. Helens Corporation.

Wick.—ELECTRICITY SCHEME.—The Town Council has adopted in principle a scheme for the installation of a 1,000-kW steam turbine, complete with boiler plant, and h.p. transmission mains to Thurso *via* Castletown, and to Helmsdale *via* Lybster, Dunbeath, and the Ord of Caithness. The cost of the scheme is estimated at £56,000, including £18,300 for plant and buildings, £30,000 for transmission mains, £2,000 for two sub-stations, and £5,700 for other expenses.

Wimbledon.—NEW AND ENLARGED SUB-STATIONS.—The Corporation Electricity Committee recommends the provision of three new sub-stations and one transformer kiosk, and the enlargement of sixteen existing sub-stations, during the year 1931-32, at an estimated cost of £8,500.

NEW MAINS.—The Electricity Committee is to supplement and replace existing h.p. mains at a cost of £14,583.

Tramway and Railway Notes.

Burnley.—PROPOSED "SPEED-UP."—The question of "speeding-up" the Corporation tramcars by installing modern motors is receiving the attention of the tramway manager. The motors of the Burnley cars are 25 years old, and to fit new motors will cost £1,000 per car. The question whether the policy of abandoning the tramways would not be better and cheaper in the end is also being considered.

Continental.—SWEDEN.—Both Chambers of the Riksdag have accepted the Government's proposal for the electrification of the Stockholm-Malmoe line.—*Reuter's Trade Service* (Stockholm).

Darwen.—RAILLESS-CARS.—The Corporation has decided to investigate the advantages of operating railless-car services in place of tramways.

East Ham.—RELAYING OF TRACK.—The Corporation Tramways Committee has received the consent of the Ministry of Transport to the proposed laying of a double line of tramway in place of the existing interlacing and double line over Manor Park Station Bridge.

Irish Free State.—DUBLIN.—A number of new "luxury" tramcars are to be built for use in the city. A model car which is being constructed at the works of the Dublin United Tramways Company will be completed shortly.

Japan.—PURCHASE OF ELECTRIC LOCOMOTIVES.—It is stated that the I.G.R. has decided to purchase about sixty electric locomotives during the fiscal years 1931-32 and 1932-33 for use on the Central, Joyetsu and Tokaido lines. They will be bought entirely from Japanese manufacturers.

London.—CITY CORPORATION AND THE PASSENGER TRANSPORT SCHEME.—At a meeting of the City Corporation on February 5th a resolution was submitted for the rescission of an earlier resolution approving the Government's scheme for the co-ordination of London passenger traffic. Although a majority voted in favour of the motion, it was lost, as a two-thirds majority was needed to carry it.

REDUCED SUNDAY FARES.—The London County Council Highways Committee recommends the re-institution of 2d.-all-the-way fares on the Council's tramways as an experiment from April 19th to September 27th, 1931. The Committee considers that the decline of 4.8 per cent. in the revenue during August, September and October last, when the previous experiment in Sunday 2d.-all-the-way fares was made, was attributable to the conditions of weather, trade and competition, and also to the effect of closing the Kingsway subway.

Manchester.—HALFPENNY FARES.—The adoption of halfpenny fares on the tramways is to be considered by the City Council.

Newcastle.—TRAMWAY DECISION.—Three months ago the Corporation Transport and Electricity Committee agreed as an experiment to run the Jesmond Road cars to the boundary at Cragside. As the number of passengers on this route never exceeded four, it has now been decided to revert to the old terminus at Newton Road. The extension meant that the cars had to run an extra 700 miles weekly, but the receipts showed a loss of 11d. per mile.

Warrington. — PROPOSED TRAMWAY ABANDONMENT. — The Town Council proposes to substitute 'buses for tramcars on two routes.

West Ham.—NEW TRAMCARS.—The Town Council is applying for sanction to the borrowing of £30,000 for twelve new tramcars.

Telegraph and Telephone Notes.

Argentine-Holland Radio Service.—DIRECT CIRCUIT.—A direct wireless telegraph service between the Argentine and Holland was opened on February 2nd. Messages were exchanged between the Queen of Holland, General Uriburu, and other officials.—*Reuter* (Buenos Aires).

Canada.—TELEPHONY.—The Alberta Department of Railways and Telephones is to spend £90,000 during the current year on the completion of the section in that province of the trans-Canada telephone lines. The amount named will cover the construction of 160 miles of line from Strathmore easterly to the Saskatchewan boundary. Work carried on in 1930 in connection with the all-Canada route cost about £90,000. In some cases lines already in use were brought up to the higher standard of efficiency set for the coast-to-coast line, which is expected to be in operation by the end of 1931, and will then obviate the necessity of routing calls through the United States at certain points. Eight company and governmental systems are co-operating to provide the through circuit, which will make conversation possible between Halifax and Vancouver by an all-Canadian route. The systems in question are those of the Maritime Telephone and Telegraph Company, the New Brunswick Co., the Bell Telephone Co. of Canada, the Manitoba, Saskatchewan, and Alberta Government systems, and the British Columbia Co. It was announced recently in Vancouver that the British Columbia Co. had started the construction of that section of the line passing through the Pacific province, which will cost £250,000 and involve the installation of 655 miles of line, of which 125 miles has already been built. The British Columbia link is to connect with the line being built by the Alberta Government through the Crow's Nest Pass, the line passing by way of Macleod, Calgary, Medicine Hat, and onwards to the Saskatchewan boundary. In eastern Canada much work has been done during the past few years in preparation for the service, and in Montreal recently representatives of the eight operating systems met at a special maintenance school conducted by the Bell Company to study problems connected with the operation of this new 4,000-mile line.

BELL SYSTEM.—The Bell Telephone Company of Canada, Ltd., the largest of the telephone systems operating in the Dominion, intends to spend £4,000,000 on development during 1931. The company operates exclusively in the provinces of Ontario and Quebec, and has during the past five years invested not less than £24,000,000. Central office equipment will cost upwards of £1,000,000; long-distance (outside) plant about £550,000; exchange lines nearly £1,000,000; land and buildings £200,000; and subscribers' equipment over £1,000,000. The company will continue to carry out the conversion of its urban systems from manual to automatic service. Montreal, Toronto, Hamilton, Quebec, and Windsor have dial switching apparatus. "Carrier" equipment is to be added to the long-distance line from Oshawa to Winnipeg in order to provide additional channels.

International Telephony.—GREECE.—Telephone tests between Belgrade and Salonika have been carried out with excellent results. A regular service will shortly be inaugurated between Athens and Belgrade.

Portugal.—RADIO AT SEA.—The Radio Maritima Portugesa Limitada is the name of a new company which has lately been organised in Lisbon to organise a wireless communication system between ships flying the Portuguese flag.

The Telephone Service.—MANCHESTER PROGRESS.—The local Advisory Committee's annual report for 1930 (South Lancashire district: Mr. T. E. Herbert, superintending engineer) shows that during that year the number of instruments in the Manchester district increased to 94,931, a growth of 2,963, or 3.2 per cent. The number fitted was 11,576 and the cessations 8,599; there has been a growth of 61,304, or 187 per cent., in 18 years. Although more telephones were fitted in 1930 than in any preceding year, the cessations also increased, thus restricting the net gain; that was due to the prevailing bad trade conditions. Effective trunk calls and telegrams transmitted by telephone in the district totalled 6,848,019, a decrease of 312,271. Approximately 70,710,000 local calls were originated, an increase of about 460,000. The first stage in the conversion of the Manchester area to automatic working was completed with the opening of the Ardwick, Collyhurst, and Moss Side director exchanges, and the advance portion of the new toll manual switchboard early in June, 1930. The second stage (which will include the opening of the Blackfriars automatic exchange) will be completed in 1931 and special provision for manual and auto-manual equipment of the latest type to deal with the large amount of toll traffic should result in "through" junction traffic (involving calls to and from most of the exchanges within a 30-mile radius) being considerably improved.

New exchanges fitted with the latest type of manual equipment were opened at Great Moor and Marple, a rural automatic exchange was installed at Hartington, and the existing equipment at 13 exchanges was extended; many additional cables were provided and several additional repeater equipments were completed; special types are about to be installed for use on the special circuits provided for the B.B.C. services. Street kiosks increased by 79 to 589, some 37 rural call offices were added, and 500,000 phonograms were dealt with.

Radio Notes.

Belgium.—NEW LAW.—The new law passed by Parliament last June came into force on February 1st, when the National Broadcasting Institute made its first transmission, through the Velthem station at a power of 15 kilowatts on wave-lengths of 508.8 metres in the French language and 333.5 metres in Flemish. The Institute is under the control of a managing committee headed by the Minister of Posts and Telegraphs, under State Control. All persons possessing a listening set must pay a fee of 60 fr. a year.

Canada.—QUEBEC RESISTS FEDERAL CONTROL.—The Quebec Provincial Government is contesting the claim of the Federal Government to the exclusive right to control the broadcasting service and the question will shortly come before the Courts. The decision will have a bearing on the proposed Dominion legislation to be introduced in the coming session of Parliament to establish control by a Commission along the same lines as that obtaining in Great Britain and recommended last year by the Royal Commission headed by Sir John Aird. The Province of Quebec is claiming exclusive rights within the Province, and it is possible that a final appeal may be made to the Judicial Committee of the Privy Council, which may result in the postponement of any action for a year or longer.—*Reuter* (Ottawa).

Germany. — MICROPHONE ELIMINATION. — Experiments are being conducted in Hamburg in connection with the transmission of piano music without using a microphone. According to Messrs. Philips Lamps, Ltd., the string vibrations are directly converted to electrical vibrations and fed to the transmitter. Tests are also being made to ascertain whether the principle can be applied to other musical instruments.

Italy.—VATICAN CITY.—Experimental radio-telephone conversations took place on February 3rd for the first time between the Vatican City and various parts of the world, including Canada and Australia. The new station was officially inaugurated on February 12th. The aerials are supported by two 200-ft. self-supporting lattice steel masts and are connected to the transmitter by a feeder system which passes through the city wall, the station buildings being in the garden near the observatory. The plant has a world-wide range and is adaptable for both telegraphy and telephony. The short-wave transmitter is of Marconi manufacture and operates on 19.84 and 50.26 metres. The station's call letters are "HVJ."

North Regional Station.—TESTS.—The B.B.C. announces that during the past month satisfactory progress has been made with the installation of the transmitters and the equipment in the control rooms at the north regional station at Moorside Edge, near Huddersfield. It is probable that one transmitter will be heard testing outside programme hours on 479 metres before the end of February, but listeners should not attach any importance to the results of unannounced tests, as the power and modulation may be widely different from those that will obtain during publicly announced transmissions which will follow.

United States.—LARGE VALVES.—Station KDKA is now conducting experiments with new 200-kW valves in the expectation of transmitting shortly a series of tests. Its experimental licence from the Federal Radio Commission authorises the use of up to 400 kW in the series of experiments, which will require the use of two valves, each of which stands six feet high and requires the passage of five tons of cooling water through its jacket every hour. According to *World Radio*, the engineers are arranging the plant so that six of the valves may ultimately be used, which would give the station an output of 1,200 kW.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraphs Department. March 17th. 80 miles of rubber-insulated, cotton-covered twisted conductors. (A.X. 10697.)*

March 31st. Single- and double-wound resistance spools. (A.X. 10754.)* Lead-covered telephone switchboard cable. (A.X. 10753.)*

April 7th. Testing instruments. (A.X. 10755.)*

SYDNEY (N.S.W.).—April 8th. Government Railways. One 2,500-kW alternator for Lithgow power station. (A.X. 10761.)*

MILDURA (VIC.).—March 14th. Town Council. 1,000-kW steam turbo-generator and equipment. (A.X. 10766.)*

Aylesbury.—March 2nd. Electricity Department. General stores for twelve months. (See this issue).

Bedford.—February 27th. Electricity Department. E.h.p., h.p., and l.p. underground cables. (See this issue).

Belgium.—BRUSSELS.—March 4th. Telegraph & Telephone Department. Supply and laying of telephone cables between (1) Ghent and La Panne, (2) Brussels and Dinant, (3) Brussels and Mont Saint Jean, (4) Charleroi and Mons, (5) Mons and the French frontier, and (6) Liège and the German frontier. Particulars (Cahier des Charges Special No. 3542) for 25 fr. from Régie des Télégraphes et Téléphones.

IXELLES.—February 26th. Administration Communale. H.p. and l.p. armoured cable. Specification (Cahier des Charges) from Service de l'Electricité, 20 Rue d'Alsace-Lorraine.

Blackburn.—March 9th. Electricity Department. Cable, wire and meters. (See this issue.)

Blackpool.—Corporation Baths Committee. Public address and music reproducing apparatus. (See this issue.)

Bradford.—March 5th. Corporation. Two water-tube boilers. (See this issue.)

Cardiff.—March 9th. Electricity Department. Transformer. switchgear, and cables. (See this issue.)

Chile.—SANTIAGO.—March 10th. Port Works Department. Ministry of Marine. Three electric slewing and travelling cranes, with portal, for the Port of Iquique. (A.X. 10740.)*

Dartford.—February 21st. Urban District Council. Cables. (See this issue.)

Eccles.—February 23rd. Electricity Committee. L.p. paper and fibre insulated cables. Specification and form of tender from borough electrical engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—March 12th. City Council. Underground cables, conduits, fuse boxes and boards, meters, link disconnecting boxes, &c. (See this issue.)

Egypt.—CAIRO.—March 31st. Ministry of Public Works. Supply and erection of h.p. overhead transmission lines in isolated basins of Upper Egypt. Copy of specifications and conditions of tender can be obtained from the Office of the Chief Inspecting Engineer of the Egyptian Government, 41, Tothill Street, Westminster, S.W.1, against payment of £E10.—*Reuter's Trade Service* (Cairo).

Fife.—February 16th. County Council. Heating and electrical work at Markinch Public School. Schedules (deposit £1 1s.) from Mr. G. Sandilands, architect, Education Offices, Kirkcaldy.

Fleetwood.—March 2nd. Electricity Department. Rotary convertors, transformers, and switch panels. (See this issue.)

Glasgow.—February 18th. Corporation. Steel poles and cable for overhead work. Specifications, &c., from Inspector of Lighting, 20, Trongate. Offers to Town Clerk.

Harrogate. — February 27th. Electricity Department. General stores for twelve months. (February 6th.)

Hull.—February 16th. Electricity Department. Electrically-operated sluice valves (42 in. and 48 in.) Mr. J. N. Waite, city electrical engineer, electricity works, Sculcoates Lane (deposit £2). Static transformers. (January 30th.)

Leeds.—February 17th. Electricity Department. General stores for twelve months. (January 30th.)

London.—CENTRAL ELECTRICITY BOARD.—February 16th. 66,000-V and other cables in connection with the North-East England Electricity Scheme. (January 16th.)

February 23rd. Construction of site works, foundation works and buildings in connection with the North-East England Electricity Scheme. (January 30th.)

March 2nd. Central indication and telephone equipments in connection with the South-East England Electricity Scheme. (January 16th.) Construction of central control station building at Leeds in connection with the Mid-East England Electricity Scheme. (February 6th.)

March 9th. 33 kV overhead transmission lines in connection with the North-West England and North Wales Electricity Scheme. (January 30th.)

LONDON COUNTY COUNCIL.—February 17th. Wireless installation at Tooting Bec Hospital. (January 30th.)

February 16th. Wiring and fittings for electric lighting in tenement dwellings at the Stamford Hill housing estate, Hackney. (January 30th.)

HAMMERSMITH.—February 25th. Borough Council. General electrical stores for twelve months. (January 30th.)

Manchester.—February 16th. Electricity Committee. House-wiring material in connection with prepayment wiring scheme. Specification (deposit £1 1s.) from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

New Zealand.—WELLINGTON.—Public Works Department. March 17th. 11,000-V switchgear and metering equipment for controlling a 15,000-kVA sub-station. (A.X. 10719.)*

April 28th. 5,000-kVA 66/33-kV transformer bank for Lake Coleridge power development. (A.X. 10768.)*

April 9th. Government Railways. Transformers, armoured cable, instrument transformer, cable boxes, instruments, static condensers, and isolating links. (A.X. 10758.)*

April 14th. Four single-phase 110-kV transformers. (A.X. 10721.)*

Post and Telegraph Department. March 3rd. Carbon diaphragms for telephone instruments. (A.X. 10720.)*

March 19th. 300 indicator alarm fuses. (A.X. 10747.)*

March 31st. 500 five-conductor cords. (A.X. 10746.)*

April 2nd. 880 yards of lead-covered telephone cable. (A.X. 10769.)*

Northern Ireland. — BELFAST. — Electricity Department. February 21st. General stores for twelve months. (January 30th.)

March 4th. Police Committee. Automatic traffic-control equipment. (January 30th.)

Plymouth.—February 21st. Corporation. Cast-iron pipes. circulating water screen, &c. (February 6th.)

Pontefract.—February 23rd. West Riding Education Committee. Electric lighting installation at King's School. Specifications from education officer, County Hall, Wakefield.

South Africa.—PRETORIA.—March 13th. Town Council. Condensing plant and auxiliary apparatus for one or two large turbo-alternators. (G.X. 10,001.)*

CAPE TOWN.—Electricity Department. March 12th. Airport illuminating equipment. (A.X. 10752.)*

BARBERTON.—March 12th. Municipal Council. Hydraulic pipe line and hydro-electric generating set of 150 kW. (G.X. 10074.)*

Uruguay.—MONTEVIDEO.—April 8th. Administration of State Electricity Works. Automatic cut-outs. (A. 10777.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Ashton-under-Lyne.—Corporation. Accepted :—
Holmes-Reyrolle system of electric traffic control signals.—Equipment & Engineering Co., Ltd.

Ayr.—County Council. Accepted :—
Installation of electric lighting in schools.—M. & R. Young (London Road school, Kilmarnock, £531); Charles Price & Son (Ardrossan Academy, £311).

Barrow-in-Furness. — Electricity Committee. Recommended :—
Electric cookers (£174).—British Electric Transformer Co., Ltd.

Birmingham.—Health Committee. Accepted :—
Electric lighting, power and heating with "Unity" heaters at clinic on Firs estate.—Walker & Co. (Bearwood).

Bradford.—Corporation. Accepted :—
Electric 'bus hoist.—Equipment & Engineering Co., Ltd.

East Ham.—Electricity Committee. Recommended :—
H.p. switch panel at generating station (£587).—A. Reyrolle and Co., Ltd.
Accepted :—
Switchgear (£9,500, less an allowance of £5,285, for existing switchgear).—A. Reyrolle & Co., Ltd.

Essex.—Education Committee. Accepted :—
Installation of electric lighting at Clacton-on-Sea senior school (£277).—Shrosbery, Blakewell & Co., Ltd.

Glasgow.—Transport Committee. Recommended :—
D.c.c. wire.—Kent Bros. Electric Wire Co., and Phillips, Ltd.
Trolley wire.—Richard Johnson & Nephew, Ltd.
Housing Committee. Recommended :—
Electrical installation at 198 houses in Torbreck Street extension housing scheme.—Darroch & Espie.
Electricity Committee. Accepted :—
Supply or reconditioning of motors, &c.—Bruce Peebles and Co., Ltd. (£2,077); MacFarlane Engineering Co., Ltd. (£1,467); Electric Construction Co., Ltd. (£2,341); Lancashire Dynamo & Motor Co., Ltd. (£782); Harland Engineering Co., Ltd. (£383); Fraser and Borthwick (£180); James Keith & Blackman Co., Ltd. (£40); Brook Motors, Ltd. (£68); Waygood-Otis, Ltd. (£146).

Halesowen.—Worcester Standing Joint Committee. Accepted :—
Electric light installation at police station (£92).—J. W. A. Devoy & Son.

Ilford.—Electricity Committee. Recommended :—
Kiosk, switchgear, and transformer, for Becontree (£367).—Standard Switchgear Co., Ltd.
Two 3-phase oil-cooled transformers.—Foster Engineering Co., Ltd.

Irlam and Cadishead.—Urban District Council. Accepted : 33,000-V transmission cables and pilots (£58,731).—W. G. Glover & Co., Ltd.
H.p. and l.p. switchgear (£7,807) and transformers (£2,562).—Metropolitan-Vickers Electrical Co., Ltd.

Lamp Contracts.—The Metropolitan-Vickers Electrical Co., Ltd., has received a part contract from the L.M. & S. Railway Co. for "Cosmos" lamps for 12 months ending December 31st, 1931.
Contracts have been placed with Siemens Electric Lamps and Supplies, Ltd., for gasfilled and vacuum lamps by the Admiralty and the L.M. & S. Railway Co.

Liverpool.—Port Sanitary and Hospitals Committee. Accepted :—
Electric disinfector at the Olive Mount Cottage Homes (£180).—George Kerr & Co.

London.—SOUTHWARK.—Electricity Committee. Recommended :—
E.h.p. switchgear (£2,006).—City of London Electric Lighting Co., Ltd.
HACKNEY.—Electricity Committee. Recommended :—
Converting plant and accessories.—Bruce Peebles & Co., Ltd.
E.h.p. switchgear and remote-control equipments.—A. Reyrolle & Co., Ltd.
L.p. switchgear.—Johnson & Phillips, Ltd.
E.h.p. and l.p. cables.—British Insulated Cables, Ltd.
LONDON COUNTY COUNCIL.—Central Public Health Committee.
Installation of electric call bells at eight hospitals (£1,307).—J. Briggs.
Renewal of electric lighting mains at Eastern Hospital, Homerton (£435).—Johnson & Phillips, Ltd.
Rewiring of wards at Hackney Hospital (£484).—Electric Installations, Ltd.
Cold storage plant at Queen Mary's hospital, Sidcup (£362).—J. & E. Hall, Ltd. Sub-contractors: Higgs Motors, for electric motors; Wallington Jones & Co., for insulation chamber; N. W. Woods and Co., Ltd., for fans.

Plymouth.—Electricity Committee. Accepted :—
15,000-kW turbo-alternator (£49,653). — Metropolitan-Vickers Electrical Co., Ltd.
L.p. switchgear for twelve months.—George Ellison, Ltd.

Rotherham.—Watch Committee. Recommended :—
Traffic control signals (£265).—Barber & Colman, Ltd.

Wakefield.—Water Committee. Accepted :—
Hydro-electric installation at waterworks (£525).—Gilbert, Gilkes & Gordon, Ltd.

Wimbledon.—Electricity Committee. Accepted :—
Portable oil-purifying plant (£150).—Hopkinsons, Ltd.

Forthcoming Events.

Electrical Engineers' Ball. — Friday, February 13th. Grosvenor House Hotel, Park Lane, W.

Faraday House Old Students' Association and Faraday House Rugby Club.—Friday, February 13th. Hotel Russell, Russell Square, W.C. 8 p.m.—2 a.m. Supper dance.

Salford Technical and Engineering Association.—Saturday, February 14th. Royal Technical College, Salford. 7 p.m. "Sound Pictures." Mr. A. G. Patterson.

Institution of Electrical Engineers (North-Eastern Students' Section).—Friday, February 13th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "Vision and Opportunity." Mr. B. H. Leeson.

(Mersey and North Wales (Liverpool) Centre).—Monday, February 16th. Arts Theatre, University, Liverpool. 7.30 p.m. Faraday lecture. "The Birth of Electrical Engineering." Prof. W. Cramp.

(North-Western Students' Section).—Tuesday, February 17th. Engineers' Club, Manchester. 7.15 p.m. Informal discussion on "Communications."

(South Midland Students' Section).—Tuesday, February 17th. University, Birmingham. 7 p.m. Short papers. Saturday, February 21st. Visit to British Industries Fair, Birmingham.

(Sheffield Sub-Centre).—Wednesday, February 18th. Royal Victoria Station Hotel, Sheffield. 7.30 p.m. Address by the president, followed by smoking concert. Friday, February 20th. Royal Victoria Hotel. 7.30 p.m. Annual supper-dance.

(Tees-side Sub-Centre).—Wednesday, February 18th. Cleveland Technical Institute, Middlesbrough. 7 p.m. "Loud-speakers Since their Conception, with Gramophone Pick-ups and Wireless Recording Apparatus," by Mr. S. G. Brown (to be delivered by Major C. A. Russell Stower).

(London Students' Section).—Friday, February 20th. Institution, London. 6.15 p.m. Informal discussion. "Are the Present Methods of those Interested in the Supply of Current and Apparatus Conducive to the Spread of Domestic Electrification?" To be opened by Mr. V. S. Lake and Mr. W. F. J. Walton.

Association of Supervising Electrical Engineers.—Tuesday, February 17th. Junior Institution of Engineers, London. 7.15 p.m. "Modern Power Station Turbo-alternators." Mr. L. H. L. Badham. Saturday, February 21st. Hotel Great Central, London. Annual dinner.

Overhead Lines Association.—Wednesday, February 18th. Institution of Electrical Engineers, London. 5.30 p.m. Discussion on "Wayleaves."

Illuminating Engineering Society.—Wednesday, February 18th. Home Office Industrial Museum. 7 p.m. Discussion on "Problems in Illuminating Engineering."

British Institute of Radiology Incorporated with the Röntgen Society.—Thursday, February 19th. Institute, London. 8.30 p.m. Radium Symposium.

Master Sign Makers' Association.—February 19th-20th. Holborn Restaurant, London. Second annual conference.

British Electrical Development Association.—Friday, February 20th. Royal Society of Arts, London. 7.30 p.m. Salesmanship Conference. "Electrical Methods—Ventilation and Air Conditioning." Mr. J. I. Bernard.

Physical Society.—Friday, February 20th. Imperial College of Science, South Kensington, S.W. 5 p.m. Short papers.

Finsbury Technical College Old Students' Association.—Saturday, February 21st. Trocadero Restaurant, London. 6.30 for 7 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

Address of Messrs. Cooper Smith, Ltd., makers of a double tone siren.

Address of Small Mouldings, Ltd., makers of lamp-holders.

"HAWKER" electric toaster.

EST. F.E.M.A. vacuum cleaner.

"LOCARNO" combined gas and electric cooker.

Notes.

Midland Electrical Engineers' Ball.

We offer our congratulations to the committee of the Midland Electrical Engineers' Ball and to the honorary secretary, Mr. W. Y. Anderson, upon having sent £70 as a donation from the proceeds of the 1930 ball towards the Institution of Electrical Engineers' Benevolent Fund.

Salaries and Wages.

Mr. W. McClelland, C.B., the president, occupied the chair at the monthly luncheon of the Batti-Wallahs' Society on Thursday last week. The principal guest was Alderman W. Walker, who delivered a brief address upon the subject of salaries and wages in the electricity supply industry. The speaker, who has taken the leading part in formulating wages and conditions in the industry, maintained that if it was thought necessary to ensure continuity of supply and smooth running by the provision of adequate and efficient plant, it was surely worth while spending a little money to ensure harmonious relationships between the undertaking and its staff. Prior to the war wages and conditions in the industry were chaotic; now every worker in the industry knew exactly what his proper wages and conditions of employment were. By means of the district and national councils they had secured settled conditions in the industry and no strike was possible until every means of conciliation had been exhausted. In the last resort reference was made to the Industrial Court whose decisions so far had been accepted without question. The industry had been accused of paying higher wages than those paid for corresponding work outside the industry. That was true, but the actual percentage difference was small. They held that this was necessary to attract and retain the best type of man in this highly-skilled and important public utility service. When foreign delegations wished to examine the results of the working of the Whitley Council system in this country they were invariably referred to the National Joint Industrial Council for the Electricity Supply Industry. Alderman Walker then dealt with the subject of staff salaries. He said that before the institution of the present system staff engineers were abominably paid, and it was difficult to obtain and keep the right kind of man. Now matters had improved and every undertaking had adopted the National Joint Board's schedule, which was based on the size of the station and was uniform for the whole country. Chief engineers did not come within this scheme; a separate scale of salaries had been drawn up for them and it had been approved by between 40 and 50 per cent. of the municipal undertakings.

In thanking Alderman Walker for his address, Mr. A. W. Blake expressed the supply industry's realisation of the debt which they owed him for his many years of work upon the subject of wages and conditions.

Mr. M. Whitgift, the hon. secretary, announced that the next luncheon would be held on March 18th when Sir William Ray, L.C.C., would speak on "The Purchase of British Materials by Municipal Bodies"; and that the annual dinner and ball was to take place on March 20th.

The Electrical Association for Women.

At a meeting at Liverpool on February 2nd it was decided to form a Liverpool and District branch of the E.A.W. After an amusing and interesting speech by the Lord Mayor of Liverpool, who presided, Miss C. Haslett, C.B.E., director, E.A.W., addressed the meeting on the objects and aims of the Association. Mrs. F. C. Wilson, C.C., wife of the chairman of the Tramways & Electric Power and Lighting Committee was appointed the first president, Mrs. R. L. Burns the chairman, and Mrs. Percy Davies the secretary.

The Bradford branch celebrated the first anniversary of its inauguration on January 31st, when Lady Watson, J.P., branch president, took the chair. Miss Eva Moss, secretary, said the branch had exceeded by nine its aim to secure 100 members in twleve months.

On January 29th, a practical lecture was given at the headquarters by Mr. H. Bourne (Hendon Electric Supply Co.), who explained the uses of the fuse in a wiring installation.

Members of the South Wales and Monmouthshire branch paid a visit to the bakeries of Messrs. Merrett's, Ltd., Cardiff, on January 30th. The visitors were particularly interested in the treatment of dough in the mixing with ultra-violet light by means of mercury-vapour lamps, in addition to mixing and moulding, &c., by electrically-driven machinery.

In the absence of the president (Lady Gray) Councillor Mrs. Wilson presided over the annual meeting of the Hartlepools and District branch of the Association on January 20th, when the borough electrical engineer (Mr. H. E. Blackiston) gave a short talk on the meaning of the clauses relating to electricity in the borough extensions Bill now before Parliament.

The North-West Midlands branch of the E.A.W. held its first dinner recently at Stoke. About 43 members and friends attended, including Mrs. H. Leese (president) and Mr. C. H. Yeaman (city electrical engineer).

At a meeting in Halifax on January 16th, at which Miss C. Haslett, C.B.E., was the principal speaker, a branch of the Association was formed. Lady Fisher Smith accepted the presidency of the branch, and the following ladies were appointed officers: chairman, Mrs. C. Ramsden; vice-chairman, Mrs. Hodgson; secretary, Mrs. Rendell-Baker; treasurer, Mrs. W. Brenard.

On January 17th the Ashford and District branch of the Association held a meeting at Whitstable with a view to stimulating interest and to start a section of the branch in that town. Mrs. A. J. Southam, president of the branch, spoke on the aims and objects of the Association, and the meeting was undoubtedly a great success.

At the annual dinner of the Ashford and District branch on January 28th, when Mrs. A. J. Southam, branch president, took the chair, Miss Haslett appealed to the industry to accept trained women, and to educational authorities for their co-operation.

Mining Engineers' Dinner.

There was a large attendance at the annual dinner of the South Wales branch of the Association of Mining Electrical Engineers at Cardiff on February 7th. The branch chairman, Sir Arthur Whitten Brown, K.B.E., M.I.E.E., presided, and those present included Mr. J. W. Gibson, national president, and Major E. Ivor David, national president-elect. Mr. J. W. Gibson said the Association received recognition on all sides of the mining industry. The status of the mining electrical engineer had been established, and of great importance was the possibility in the near future that important posts would have to be filled by certificated men; in the absence of any other standard, he felt sure that the certificate of their Association would be of great value.

Appointments Vacant.

Assistant mains engineer for Norwich Electricity Department.

Junior assistant mains engineer for Salford Electricity Department.

Sales and showroom assistant for Rhyl Electricity Department.

(See our advertisement pages to-day.)

Economics and Engineering.

At an informal joint meeting of the I.E.E. London Students' Section with corresponding sections of the Institutions of Civil and Mechanical Engineers, Mr. N. F. T. Saunders, Grad. I.E.E., read a paper on "The Relations between Economics and Engineering." His main thesis was that "economics" unlike "engineering economics" was not an exact science, and was not based on agreed definitions. The vital factor in the evolution of the present economic system was capital, but the present system was not final but was a step towards a condition in which the entire human need would be supplied without human effort, the only alternative to unemployment was therefore increased business. Demand for a commodity was limited by (1) ability to offer exchange value, and (2) desire for the commodity. Under the present system, the only way of measuring the limit of demand was to increase the supply until it exceeded the demand. Avoidance of the satiation limit was made by (*a*) advertisement, (*b*) price reduction, and (*c*) reduction of rate of production. The true purpose of advertisement was to ensure that the apparent operation of the desirability factor was genuine, but this was often lost sight of with wasteful results. Purchasers were mainly workers, and if the wage of a worker were 50 per cent. of the sale price of his product, then he could not purchase more than 50 per cent. of his output. If his output increased he could consume proportionately more only if his wages increased *pro rata*. With mass production, as the production price of an article was reduced the rates of wage cost to total price decreased, so that satiation was merely aggravated. Reducing production tended to divert capital to other uses in which the wage amount of its price was a lower proportion than before; this explained the growth of luxury trades.

The conclusion reached was that unemployment was not an evil to be cured by any of the fiscal or political methods advocated, but was inherent in the method of evolution.

The following took part in the discussion:—Messrs. Turner, Ely, Tozer, Robinson, Kerr, Radcliffe, Neal, Salter, Evans, Crutch, Taviner, and W. E. Highfield.

The Illuminating Engineering Society.

The annual dinner of the Illuminating Engineering Society was held last Tuesday at the Trocadero Restaurant, London. The president (Lt.-Col. Edgcumbe) took the chair and about 200 members and guests were present.

The toast of "The Illuminating Engineering Society" was proposed by SIR JOHN BROOKE, C.B. (deputy chairman, Electricity Commission) who commended the Society for stressing the scientific aspect of its subject and providing a platform whereon scientific men could meet. As "brightness engineers" its members were doing much to destroy the prevalent belief that the darkness hitherto accepted was an adequate background for civilised man. Recent investigations had shown that in only 5 per cent. of 12,000 shop windows was a proper standard of illumination attained. It was a dangerous anachronism that moving vehicles should often provide the only adequate lighting of streets, but standards were improving though not fast enough. Since 1920 the amount of gas used for public lighting had increased by 19 million therms, or 56 per cent. (over 6 per cent. per annum), while electricity might also be said to have made some headway! He referred to the president as a successful business man with a scientific outlook—the kind the country most needed.

Lt.-Col. Edgcumbe (president), responding, said that it was 22 years last Monday since Leon Gaster had proposed the formation of the Society, and 21 years and 2 months since its first meeting. Three or four of the original enthusiasts were still members, including Mr. J. S. Dow, the honorary secretary. The membership, all grades, was now 500, and included several foreign engineers, and the Society worked in close association with the International Illuminating Congress.

Dr. S. W. T. WALSH, M.A., D.Sc. (past president), proposing the toast of "The Guests," referred to the close co-operation that had been brought about between illuminating engineers and architects with a view to ensuring that the lighting of a building should be an essential part of it.

SIR JOSEPH PETAVEL, K.B.E., F.R.S. (director, N.P.L.), and MR. H. V. ASHLEY responded in brief speeches, amusing and to the point.

The second part of the function was a dance, which was evidently quite thoroughly enjoyed and which continued until close on midnight. In an interlude the result of a guessing (or estimating) competition as to the number of foot-candles illuminating the dining tables was announced. Col. Sir Thomas Purves estimated (or guessed) most and very closely to the correct figure of 5.78 foot candles, and Mrs. W. Beckett won the ladies' competition with a poetical description of the general effect of the illumination.

Concrete Overhead-line Poles.

A year or two ago a discussion took place on the subject of concrete overhead-line poles, the conclusion arrived at being that at that time their use was not an economic proposition for lines in rural areas. Since then improvements may, however, have changed the conditions, and we understand that the Overhead Lines Association is now anxious to collect the latest and most up-to-date information on such poles as available for use in, and manufactured in, this country. Information will be welcomed by Mr. G. W. Molle, hon. secretary, 44, Devonshire Chambers, 146, Bishopsgate, London, E.C.2.

Industrial Electric Heating.

Lecturing on "Industrial Electric Heating," with reference particularly to electric furnaces, Mr. Verdon O. Cutts, London, speaking under the auspices of the Royal Scottish Society of Arts at Edinburgh, cited instances in which certain trades had been completely revolutionised by the introduction of electric heating in the place of fuel-fired furnaces and ovens. In many circumstances and for many purposes the electric furnace was capable of competing with fuel-fired furnaces on a "straight cost" basis. The range in size of electric furnaces was at least as great as the variety of operations to which they were applied, furnaces varying in hearth capacity from 1 to 200 sq. ft. and in internal capacity from 1 to 1,000 cu. ft. An automatic continuous recuperative furnace had just been designed which was no less than 150 ft. long.

Shop Lighting in France.

In a recent issue of our French contemporary *Lux*, particulars are given of a campaign carried out by the Compagnie Parisienne de Distribution d'Electricité to encourage the better lighting of the windows of shops in Paris. Taking thirty busy thoroughfares, a list was compiled of 474 shops, of which the windows were considered to be badly lighted. Following that, at intervals of eight days, three booklets were sent to the shop owners, all dealing with the subject of window lighting. With the last one a notice was sent that a representative of the supply company would call and, if agreeable, arrange for a test of improved lighting. The result was that within three months of the inauguration of the campaign 106 of the shopkeepers had themselves effected an improvement of the lighting of their windows, the lighting of those of 37 shops were improved according to the advice of the supply company, 32 had arranged for tests of the suggested improvements, 56 cases were under negotiation, while as regards 243 shops, or just over 50 per cent. of the total, the company's offer was declined. In view of the large number of refusals, an inquiry was instituted as to the causes, which were found to fall mainly in the following four groups: (1) fear of increased electricity consumption, (2) cost of the new lighting equipment, (3) the disturbance caused by making tests, and (4) existing lighting arrangements regarded as satisfactory.

Educational.

NORTHAMPTON POLYTECHNIC INSTITUTE, St. John Street, E.C.1. —A course of four lectures on dielectrics is to be given by Mr. L. Hartshorn, B.Sc., A.R.C.S., D.I.C., on Wednesday evenings, commencing March 4th. (See our advertisement pages to-day.)

Fatality.

A verdict of "Accidental death" was recorded at an inquest at Warley on February 7th upon John Mansfield Hands (13), who met his death whilst having a bath at his home on February 6th. According to the *Birmingham Post*, the mother stated that shortly after her son had gone to the bathroom she heard a cry and, on going upstairs, found him lying unconscious on his side in the bath, which only contained a few inches of water. There were burning marks on the thumb and one finger of his left hand. An electric heater had been placed on the window-sill for the purpose of heating the room, but she could not say whether it was on or off, or whether it had been tilted. Dr. F. G. Roulston expressed the opinion that death was the result of electrocution. He thought the lad had in some manner caught hold of a "live" wire of the radiator with his left hand. The fact that the boy was standing in the water would form a contact, and he would receive the full force of 220 V. The Deputy Coroner suggested that it might be possible for the manufacturers of the electric heaters to provide an article which would give more protection to the people who used them.

E.H.P. Laboratories.

CORRECTION.—It is regretted that some of the remarks of Mr. N. E. P. Harris during the recent I.E.E. discussion on the above subject were mis-reported in our January 30th issue, p. 216. He endeavoured to convey his whole-hearted condemnation of the old practice of designing bushing insulators with enclosed air spaces. Unfortunately that inefficient and dangerous practice is not quite dead, and during the past few weeks Mr. Harris had actually seen and condemned designs in which enclosed air was utilised in series with other dielectrics without the slightest regard to the potential gradients.

A Novel Distribution Scheme.

In the "Notes" columns of our issue of January 16th last, p. 114, under the heading "A Bulk-supply Scheme," we gave some particulars of the bulk-supply scheme for Ballymena, Northern Ireland, which was officially inaugurated on December 29th. A feature of the scheme is the use of six-core cable for the l.p. distribution, in connection with which Messrs. W. T. Henley's Telegraph Works Co., Ltd., by whom the cable was manufactured and installed, have sent us the following information.

The cable is designed to give a supply of current for heating water, at a low cost per kWh, at all times except during the peak-load period. The cable is, in effect, an ordinary three-phase cable with a neutral half-section core, a small section conductor for street lighting, and the sixth core of equal section to the neutral for the water-heating service. The idea is that during the peak-load period, possibly a matter of two to three

Six-core Cable used for Ballymena Scheme.

hours in each twenty-four, the water-heating core will be disconnected by means of time switches in the sub-stations. This core will, of course, be connected to a separate meter on the premises of each consumer, and the controlled supply will be charged for in the neighbourhood of, say, 0.5d. per kWh. In Northern Ireland there are many linen mills which require hot water and low-pressure steam for process work and are in use for twenty-four hours a day. While such consumers could be supplied at a low rate with time-switch control on the consumer's premises, the method permitted by the six-core cable is very much lower in capital cost. It is also much more satisfactory from the viewpoint of the supply authority. The scheme, which has been introduced by Mr. James Scott, M.I.E.E., consulting engineer to the Ballymena Urban District Council, is expected considerably to improve the load factor of the undertaking. The accompanying illustration shows the construction of the cable: the three-phase cores are the shaped conductors at the top, the street-lighting core being in the centre, and the neutral and water-heating cores at the bottom.

B.S.S. for Ships' Cargo-lifting Blocks.

All engineers interested in lifting gear will welcome the publication of the British Standard Specification for Ships' Cargo Lifting Blocks (No. 408-1931). This specification lays down requirements as to the materials from which the various parts of the block should be made, details as to workmanship and manufacture, the test loads to which blocks are to be submitted, and recommendations as to the sizes of sheaves for use with wire ropes made in accordance with B.S. Specification No. 365. One of the most important matters covered by the Specification, however, is the inclusion of a standard definition defining what is the safe working load of a given block, together with particulars of a standard method of marking blocks indicating the maximum safe working load for which the block may be used.

Copies of this specification may be obtained on application to the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

The London Electricity Supply Association.

The above is the new title of the Conference of Chief Officials of the London Electric Supply Companies of which Mr. E. H. Barrenger, 19, Carnaby Street, Golden Square, W.1, is secretary.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

A dinner was held recently at the Savoy Hotel, when members of the executive committee of the Engineering and Allied Employers' London and District Association entertained their late president, **Mr. A. Vines.** Dr. Campbell, the president of the Association, in proposing the principal toast, emphasised the necessity for "the presidential mind," and referred to the long connection of Mr. Vines with the Association, as representative of Messrs. Evershed & Vignoles, Ltd., and his work on the executive, sub- and sectional committees. Mr. Vines has also been a member of the general council of the Federation for some years, and for the last three years a member of the management board. Mr. Vines, replying, expressed his appreciation of the help given to him by the members of the executive committee and the staff of the Association. Mr. Vines was recently elected a vice-president of the British Engineers' Association.

G. C. Beresford] *[London*

Mr. A. Vines.

Past-president of the London Engineering Employers' Association.

Mr. C. T. Cocks has been appointed assistant general manager of the Johannesburg Electricity Department at a salary of £1,200 a year, plus "locomotion allowance" of £17 10s. per month. Mr. Cocks, who is 48 years of age, is at present electrical officer in charge of the Western Transvaal system of the South African Railways.

Sir John Monash, chairman of the Victorian Electricity Commission, has left for India as the official representative of Australia at the opening of New Delhi, on the invitation of the Federal Government. The State Government has given him two and a half months' leave of absence.

Sir Thomas Lyle and **Sir Robert Gibson,** on being reappointed for a further three years as members of the Victorian Electricity Commission, suggested that their salaries should be reduced from £500 to £250 per annum, a proposal that has been accepted by the Government with appreciation.

Monsieur J. Caillier, who has been connected with the "P.Q." Cable Company for several years in the capacity of secretary and assistant manager, has been appointed manager (*directeur*) in succession to **Monsieur A. Focque,** who, at his own request, has retired on pension. Monsieur Focque has not entirely severed his connection with this company, his services being retained as honorary manager and advisor.

Mr. W. B. D. Paul, formerly of Synthetic Ammonia and Nitrates, Ltd., and Edinburgh Corporation, has been appointed change-of-frequency engineer at West Hartlepool.

The Southwark Electric Light Committee recommends that the salary of **Mr. D. M. Kinghorn,** the borough electrical engineer, shall be increased from £1,100 to £1,200 per annum. The Committee points out that Mr. Kinghorn's salary is below the average paid to engineers of similar undertakings; that largely due to Mr. Kinghorn the undertaking has been made a very profitable concern; and that his duties are likely to increase rather than diminish with the advent of bulk supply.

The Council of the Institution of Electrical Engineers has made the tenth award of the Faraday Medal to **Mr. Charles H. Merz.** The Faraday Medal is awarded by the Council either for notable scientific or industrial achievement in electrical engineering or for conspicuous service rendered to the advancement of electrical science without restriction as regards nationality, country of residence, or membership of the Institution.

The Plymouth Corporation Electricity Committee recommends an increase in the salary of the deputy electrical engineer, **Mr. R. Illingworth,** from £570 to £700 per annum, rising to £750 per annum.

Mr. A. T. Starr, B.A., B.Sc., has been appointed to the staff of Faraday House Electrical Engineering College. Mr. Starr took the London B.Sc., with first-class honours in mathematics, in 1925, receiving also the Lubbock Prize for being the top man in the University. For the last three years he has been working in the laboratories of the International Telephone and Telegraph Company.

Obituary.

Mr. W. E. Gray.—Mr. William Ernest Gray, youngest son of the late Matthew Gray, whose death in his 71st year was announced in our last issue, was born at Alexandria, Dumbartonshire, in 1860, and educated at University College School, and University College, London, and also at Tours, France, and Madrid, Spain. In the year 1881 he began his long connection with the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., of which he was appointed a joint managing director in December, 1913, along with his brother, Mr. C. H. Gray, the present senior managing director, with whom he had held since early in 1909 the position of extraordinary director of the company, with the title of joint manager. During the many years he was at the Silvertown works he was in charge of what was then known as the Electric Light Department, and superintended the manufacture and laying of many miles of this class of cable in many of the principal towns and cities of the United Kingdom, and also on the Continent, including the erection of complete electricity works and mains. Amongst many important works carried out by the company under his direction were the complete electric light installations of the towns of Brussels, Dumfries, Hereford, &c., including buildings, machinery, plant, and the supplying of electrical plant to numerous towns in the United Kingdom and abroad—also the equipment of a cable factory for the French Government at Toulon. Mr. Gray was also well known to the Chinese and Japanese Governments in connection with submarine torpedo apparatus and mines, when the company used to undertake this work. He took a very active part in the formation of the C.M.A. (Cable Makers' Association) in 1899, and for a num-

ber of years was invariably in the chair at their meetings. For some years past Mr. W. E. Gray had been continually at the head office, where he devoted his attention to the activities of the company's branches at home and abroad, and regularly attended the weekly board meetings until quite recently. He was a member of the Institution of Electrical Engineers.

The late Mr. W. E. Gray.

and acted as chairman of its Committee on Model Conditions of Contracts; was an associate member of the Institution of Civil Engineers; a member of the Engineering Standards Committees on Cables and also on Cast Iron Pipes; and a member of the French Electricians' Society. He was also chairman of the Dumfries Electric Supply Co., Ltd., and was concerned in other similar companies. He leaves a widow and one daughter, who is married to Capt. A. J. K. Todd, M.P. for Berwick-on-Tweed. The funeral took place on Friday last at East Wickham. In addition to the relatives (Capt. A. J. K. Todd, M.P., and Mrs. Todd, son-in-law and daughter, Miss Gray, and Mr. and Mrs. C. H. Gray), the following were present: Col. Sir A. Weston-Jarvis (director); Mr. W. F. Lloyd (joint managing director); Mr. I. Ferguson (representing Sir J. Ferguson, chairman); Mr. W. F. Wilson (secretary); Mr. B. G. Bishop (works manager); Mr. G. A. Philpott (buyer); and Messrs. W. A. Davies, E. W. Hill, F. Read, F. Collins, and F. Williams.

Mr. J. D. H. Dickson.—We regret to learn of the death of Mr. James Douglas Hamilton Dickson, which occurred at Cambridge on February 6th. Mr. Dickson, who was born in Glasgow in 1849, was Senior Fellow of Peterhouse, Cambridge. In 1867 he became assistant to Lord Kelvin (then Sir William Thomson) and he assisted in the construction and employment of the apparatus used by Thomson in the determination of "v," the ratio of the electromagnetic to the electrostatic unit of electricity, and in the perfection of Thomson's siphon recorder. He also took part with Thomson in the laying of the trans-Atlantic cable of the Société du Câble Transatlantique Français, in 1869, and was electrician-in-charge to the company at Brest for about a year afterwards. Mr. Dickson was one of the editors of the collected papers of the late Sir James Dewar.

Mr. J. F. Simmance.—We regret to record the death, which occurred on February 4th at a nursing home in London after a short illness, of Mr. John Frederick Simmance, M.Inst.C.E., M.I.Mech.E., of Grosvenor House, Park Lane, and Westminster Palace Gardens. Mr. Simmance was a managing director of Messrs. Alexander Wright & Co., Ltd.

Mr. Cobden-Ashworth.—The many electrical trade friends of Mr. A. A. Cobden-Ashworth will regret to learn that he passed away on February 2nd at Sutton Court, W.8, after a long and painful illness.

Wills.—The late **Mr. David H. Bonnella,** founder and chairman of Messrs. D. H. Bonnella & Son, Ltd., left estate of the value of £31,893 gross (£30,293 net personalty).

The late **Sir John Henry,** a director of the Charing Cross Electricity Supply Co., Ltd., left estate valued at £45,891 gross (£42,152 net personalty).

The late **Mr. William Hamilton,** electrical engineer, of Timperley, Cheshire, left £13,119 gross (£12,225 net).

Financial Section.

New Companies Returns of Share Capital, Debenture Charges, Reports of Electrical Companies Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

M. & C. Switchgear, Ltd.—Private company. Registered in Edinburgh on January 30th. Capital, £30,000 in £1 shares. Objects: To carry on the business of engineers, electricians, merchants, agents, &c. The directors are: J. M. Mavor, 47, Redan Street, Glasgow, E., engineer; W. Lawrence, Strathblane Road, Milngavie, Dumbartonshire, engineer; E. I. Mavor, 79, Oakfield Avenue, Hillhead, Glasgow, accountant. Registered office: Kelvinside Works, Milton Road, Kirkintilloch.

Croydon Mouldrite, Ltd.—Private company. Registered February 3rd. Capital, £21,000 in 20,000 7½ per cent. cumulative redeemable participating preference shares of £1 and 20,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in vulcanite, ebonite, rubber, celluloid, resin, synthetic resin and all substances and products that can be used in substitution therefor; electricians, electrical, mechanical engineers, &c. The subscribers (each with one share) are: S. E. Penhallow, 33, Gateley Road, Brixton, S.W.9, clerk; E. H. Wiseman, 8, Severn Avenue, Gidea Park, Romford, Essex, clerk. Solicitors: J. D. Langton & Passmore, 16, Tokenhouse Yard, E.C.

Kleanair Patent Fan Co., Ltd.—Private company. Registered February 3rd. Capital, £10,000 in £1 shares. Objects: To carry on the business of electricians, electrical and mechanical engineers, &c. The subscribers (each with one share) are: J. J. Dewhurst, engineer, and Mrs. W. Dewhurst, 5, Hertford House Estate, Hertford. J. J. Dewhurst is the first director. Registered office: Carlisle House, Southampton Row, W.C.1.

Baker & Hyman, Ltd.—Private company. Registered February 4th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers and contractors carried on by L. Hyman, W. E. Oughton, and Betsy E. Hyman, at 11/13, Portland Crescent, Leeds, as "Baker and Hyman," and to carry on the business of manufacturers of and dealers in electrical, wireless, telephone and telegraph apparatus, &c. The first directors are: L. Hyman, electrical engineer, and Mrs. B. E. Hyman, Gledhow Park Drive, Chapel Allerton, Leeds; W. E. Oughton, 16, The Turnways, Kirkstall Lane, Headingley, Leeds, electrical engineer. Registered office: 11 and 13, Portland Crescent, Leeds.

Rectifiers, Ltd.—Private company. Registered February 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians and contractors, electrical, mechanical, motor, telephone, heating, ventilating and general engineers, &c. The directors are: G. Ward (permanent governing director), Stoneygate Rise, Leicester (director G. Ward (Leicester), Ltd.); F. W. Hurst, 90, St. Saviour's Road, Leicester; J. White, 7, Rose Farm Close, Braunstone Estate, Leicester; L. Griffiths, 89, Skipworth Street, Leicester. Registered office: 11, Brierley Street, Leicester.

Craig, Henderson & Co., Ltd.—Private company. Registered in Edinburgh on February 4th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, wireless dealers, &c. The directors are: D. Henderson, electrical engineer, and Mrs. Isabel Henderson, 234, Kingsbridge Drive, Kings Park, Rutherglen; and G. Craig, 89, Ardmay Crescent, Cathcart, Glasgow, engineer. Registered office: 93, Hope Street, Glasgow.

Official Returns of Electrical Companies.

Johnson & Bolsom, Ltd.—Issue on January 30th, 1931, of £830 debentures, part of a series already registered.

London Magneto Repairing and Winding Co., Ltd.—Further charge on 78, Hampstead Road, St. Pancras, dated January 21st, 1931, to secure £300. Holders: Portman Building Society, 14, Orchard Street, W.1.

Dewhurst's Engineering Co., Ltd.—H. E. Jenkinson, Hartshead Chambers, Sheffield, was appointed receiver on January 27th, 1931, under powers contained in certain debentures dated November 2nd, 1912.

Woking Electric Supply Co., Ltd.—Satisfaction to the extent of £14,000 on January 13th, 1931, of trust deed dated March 1st, 1906, and registered March 12th, 1906, securing debenture stock for an indefinite amount.

South Cumberland Electricity Supply Co., Ltd. (formerly Cumberland Waste Heat Owners Co., Ltd.).—Satisfaction in full on December 31st, 1930, (1) of debenture for £5,000 in favour of the Midland Bank, Ltd., dated January 25th, 1925, and registered January 27th, 1925 (2) of debenture for £1,500 in favour of the said bank dated September 24th, 1926, and registered October 1st, 1926, and (3) of debenture for £2,000 in favour of the said bank dated July 8th, 1927, and registered July 27th, 1927.

Yorkshire Switchgear and Engineering Co., Ltd.—Particulars filed of debentures for sums not exceeding £6,000 at any time, authorised January 19th, 1931, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £4,000.

Credenda Conduits Co., Ltd.—Capital, £50,000 in £1 shares. Return dated November 4th, 1930. All shares taken up. £30,000 paid. £20,000 considered as paid. Mortgages and charges, nil.

Price's Electrical Supplies, Ltd.—Capital, £3,000 in £1 shares. Return dated December 5th, 1930. 1,210 shares taken up. £1,210 paid. Mortgages and charges, nil.

Mawdsley's, Ltd.—Capital, £20,000 in 13s. 4d. shares. Return dated November 10th, 1930. 28,025 shares taken up. £10,683 6s. 8d. paid on 16,025 shares. £8,000 considered as paid on 12,000 shares. Mortgages and charges: £11,190 9s. 2d.

Western Electricity Supply Co., Ltd.—Capital, £350,000 in 100,000 6 per cent. cumulative preference and 250,000 ordinary shares of £1. Return dated November 18th, 1930. All shares taken up. £350,000 paid. Mortgages and charges, nil.

Tubes, Ltd.—Capital, £215,000 in £1 shares. Return dated November 10th, 1930. All shares taken up. £107,584 paid (being £1 per share on 82,859 and 10s. per share on 49,450 shares). £107,416 considered as paid (being £1 per share on 82,691 and 10s. per share on 49,450 shares). Mortgages and charges, nil.

British Brown-Boveri, Ltd.—Capital, £50,000 in £5 shares. Return dated November 28th, 1930. All shares taken up. £21,250 (£2 10s. per share) paid on 8,500 shares. £7,500 considered as paid on 1,500 shares. Mortgages and charges, nil.

Pirelli, Ltd.—Capital, £400,000 in £1 shares (increased from £250,000 on April 4th, 1930). Return dated March 26th, 1930. 200,000 shares taken up. £200,000 paid. Mortgages and charges, nil. A return of allotments made up to September 25th, 1930, shows a further 200,000 shares allotted, payable in cash, and fully called up.

McGoff & Vickers, Ltd.—Capital, £2,000 in £1 shares. Return dated November 18th, 1930. 1,750 shares taken up. £1,750 paid. Mortgages and charges, nil.

Short Wave Communications Development Co., Ltd.—H. T. Woodard, 19, Valetta Road, Acton, W.3, ceased to act as receiver or manager on January 27th, 1931.

London Power Co., Ltd.—Particulars filed of £3,000,000 debenture stock authorised January 9th, 1931, in addition to £14,000,000 debenture stock already registered, secured by trust deed dated January 16th, 1931, supplemental to trust deeds dated April 15th, 1926, November 19th, 1926, February 24th, 1928, and February 4th, 1929, the amount of the present issue being £3,000,000. Property charged: The company's undertaking, property, assets, and revenues, present and future. (ranking, *pari passu*, with the charges created by deeds dated April 15th, 1926, to February 4th, 1929.) Trustees: Law Debenture Corporation, Ltd. (The company reserves the right to create and issue additional debenture stock or debentures ranking, *pari passu*, with the above.)

Wakefield Bros., Ltd.—Particulars filed of sums not exceeding at any one time £500 debentures, authorised January 29th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

General Cable Manufacturing Co., Ltd.—Satisfaction to the extent of £1,470 on December 15th, 1930, of debenture dated July 28th, 1930, and registered August 1st, 1930. (According to the register of mortgages, the debenture registered August 1st, 1930, originally secured £1,470).

Burndept Wireless (1928), Ltd.—Capital, £200,000 in 5s. shares. Return dated January 13th, 1931. 620,021 shares taken up. £102,504 paid (being 3s. 3d. per share on 600,014 and 5s. per share on 20,007 shares). £52,501 4s. 6d. considered as paid (being 1s. 9d. per share on 600,014 shares). Mortgages and charges, £27,481.

British Blue Spot Co., Ltd.—Capital, £80,000 in 30,000 7½ per cent. cumulative preference and 50,000 ordinary shares of £1 each. Return dated December 13th, 1930. All shares taken up. £80,000 paid. Mortgages and charges, nil.

C. N. Vernon & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 10th, 1930. 900 shares taken up. £900 paid. Mortgages and charges, £700.

Electric Supply Co. of Victoria, Ltd.—Capital, £325,000 in 175,000 preference and 150,000 ordinary shares of £1. Return dated November 3rd, 1930. 175,000 preference and 125,000 ordinary shares taken up. £50,007 paid. £249,993 considered as paid. Mortgages and charges, nil.

Corwen Electric Light Co., Ltd.—Capital, £2,000 in £1 shares. Return dated November 3rd, 1930. 1,610 shares taken up. £1,610 paid. Mortgages and charges, nil.

Phœnix Dynamo Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated November 10th, 1930. Two shares taken up. £2 paid. Mortgages and charges, nil.

Mobilectric, Ltd.—Particulars filed of £250 debentures authorised January 13th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £100.

Dudley, Stourbridge & District Electric Traction Co., Ltd.—Satisfaction to the extent of the whole of the outstanding sums on January 27th, 1931, of trust deed dated May 20th, 1902, acknowledgments of indebtedness dated September 15th, 1904, and February 2nd, 1905, supplemental trust deed dated July 10th, 1924, and an acknowledgment of indebtedness dated July 15th, 1924, and registered on June 7th, 1902, September 21st, 1904, July 14th, 1924, July 25th, 1924, and July 25th, 1924, respectively.

John Kirkaldy, Ltd.—Satisfaction (1) in full on October 22nd, 1930, of first mortgage debentures for £15,000 authorised May 24th, 1897, and registered on July 10th, 1908, and (2) to the extent of £4,000 on same date (previously satisfied £8,000) of debentures for £12,000 authorised December 28th, 1906, and registered December 29th, 1906.

Robert W. Blackwell & Co., Ltd.—Satisfaction in full on November 17th, 1930, of debentures authorised December 29th, 1926, and registered January 4th, 1927, securing £14,000.

Hewittic Electric Co., Ltd.—Capital, £50,000 in £1 shares. Return dated November 4th, 1930. 40,000 shares taken up; £40,000 paid. Mortgages and charges, nil.

Shoreham & District Electric Lighting & Power Co., Ltd.—Satisfaction to the extent of £2,500 on December 12th, 1930, of £10,000 ten year notes authorised May 22nd, 1928, and registered August 3rd, 1928.

Magna Wire & Cable Co., Ltd.—Capital, £11,000 in 10,000 preference shares of £1 and 20,000 ordinary shares of 1s. each. Return dated November 28th, 1930. 2,027 preference and 11,500 ordinary shares taken up. £2,027 paid on the preference shares. £575 considered as paid on the ordinary shares. Mortgages and charges, nil.

Greater London Power Co., Ltd.—Capital, £100 in £1 shares. Return dated December 24th, 1930. All shares taken up. £100 paid. Mortgages and charges, nil.

Rotax (Motor Accessories), Ltd.—Capital, £506,500 in 253,250 preference and 253,250 ordinary shares of £1 each. Return dated November 5th, 1930. 253,034 preference and 253,250 ordinary shares taken up. £168,867 paid on 93,867 ordinary and 75,000 preference shares. £337,417 considered as paid on the remainder. Mortgages and charges, nil.

Wenham Lighting Corporation, Ltd.—Capital, £1,000 in £1 shares. Return dated October 24th, 1930. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Woodfyt Sales, Ltd.—Capital, £2,550 in 1,000 preference and 1,550 ordinary shares of £1 each. Return dated December 15th, 1930. 758 preference and 205 ordinary shares taken up. £963 paid. Mortgages and charges, nil.

Wardle Engineering Co., Ltd.—Capital, £25,000 in 10,000 preference and 15,000 ordinary shares of £1 each. Return dated September 11th, 1930. 5,765 preference and 7,429 ordinary shares taken up. £12,994 paid. £200 considered as paid. Mortgages and charges: £4,000. A return of allotments, made up to October 20th, 1930, shows a further 500 ordinary shares allotted, payable in cash and fully called up.

City Notes.

Singapore Traction Co., Ltd.

Presiding at the annual meeting on February 4th, Mr. L. W. Hawkins, chairman, in the course of his speech, said that the operating profit of £70,535 showed an increase of nearly £7,000. In a year of unprecedented and world-wide depression, pressing with special severity on the rubber and tin mining industries, with which Singapore was closely associated, these figures afforded grounds for satisfaction, and were a tribute to the stability of their enterprise. The current year was not likely to be marked by an increase of net earnings unless an improvement occurred in the economic conditions especially affecting Singapore. If they did as well as they had done in the past year they would have good reason to be satisfied, and if a slight setback should occur, it need not be regarded as other than temporary. The report and accounts were adopted.

London Power Co., Ltd.

The report for the year ended December 31st last shows that the sale of electricity yielded £2 010,207, as against £1,890,950 in the preceding year; the addition of sundry receipts and interest made a total of £2,043,388. From this is deducted expenses totalling £1,037,858 (£1,303,546), debenture interest, allocations to sinking funds, debenture issue expenses, &c., and the balance is applied in paying the usual dividend of 6 per cent. on the share capital of £50,000. The output of the power stations during the year increased from 733,238,288 to 819,438,020 kWh and the kW demand from 270,500 to 283,400. At the end of the year the effective plant capacity totalled 356,700 kW. The report states that work on the Battersea site has been continued and the plant for the first section (130,000 kW) of the station is on order and well in hand.

The annual meeting was held on February 6th, when Mr. W. F. Fladgate (chairman) in the course of his speech said that capital expenditure had amounted to approximately £2,000,000 on plant and buildings at the various stations of the company, and also on the necessary interconnecting mains. The operating cost per kWh of output for 1929 averaged 0.252d., and for 1930 this figure was reduced to 0.2215d. The progress of the installation of plant had been continuous. Deptford West had now in operation 125,000 kW of plant, and although in operation for only part of 1929 it took third place that year in the Electricity Commissioners' return of the efficiency of generating stations throughout the country. A further 35,000-kW set was now in process of erection with the necessary boilers. The report and accounts were adopted.

Bristol Tramways & Carriage Co., Ltd.

The directors' report for the year ended December 31st, 1930, shows a total revenue of £1,209,558 (against £1,199,554 in 1929) and a net revenue, including £4,278 brought forward, of £159,085 (against £167,352). After meeting debenture interest, preference dividend, and interim ordinary dividend there is a balance of £65,045. From this a final dividend of 6 per cent. is to be paid on the ordinary shares, again making 10 per cent. for the year, and a balance of £5,045 is carried forward. It is reported that while the tramway receipts fell by £10,934, those from the carriage department increased by £13,672. The number of passengers carried rose from 117,838,722 to 124,521,351. Meeting: February 18th.

Redfern's Rubber Works, Ltd.

The accounts for the year ended December 31st last show a total revenue of £38,652, and after deducting depreciation and loan interest, a net profit of £30,247, to which is added £17,994 brought in, making £48,241 available. The preference dividend is paid, together with a final dividend of 6¼ per cent. on the ordinary shares, making 10 per cent. for the year, £9,000 is transferred to reserve and £13,741 is carried forward.

Power Securities Corporation, Ltd.

The net income for 1930 was £81 655 (against £79,424 in the previous year), and £18,294 brought in is added, making £99,949 available. The ordinary dividend is maintained at 7 per cent., reserve receives £25,000 (£20,000) and £20,699 is carried forward. Meeting: February 16th.

Hall Telephone Accessories (1928), Ltd.

The profit for 1930 amounted to £68,075, as compared with £40,365 in the preceding year. A final dividend of 6 per cent. is proposed with a bonus of 4 per cent., making 15 per cent. for the year (against 12 per cent.), leaving £6,398 to be carried forward.

Charing Cross Electricity Supply Co., Ltd.

The directors have recommended a final dividend on the ordinary shares of the West End undertaking of the company at the rate of 10-1/16d. per share, less tax, which with the interim distribution, makes up the standard dividend for the year.

Electrical & Industrial Investment Co., Ltd.

The profit for 1930 amounted to £28,499 (against £23,798). Dividends are recommended of 7 per cent. on the preferred ordinary shares and 8 per cent. on the deferred ordinary stock, leaving £7,500 to be added to the undivided profits account.

Central Electric Supply Co., Ltd.

The report for the year ended December 31st last shows a credit balance of £25,750. It is proposed to pay a dividend of £7 18s. 5.538d. per cent., being the standard dividend for the year.

Dublin United Tramways (1896), Ltd.

A dividend is announced of 3 per cent. (against nil) on the ordinary shares for the year. Mortgage and debenture redemption receives £25,000, and track renewals £20,000, leaving £12,103 to be carried forward.

Calcutta Electric Supply Corporation, Ltd.

It is reported that the company is offering 300,000 new ordinary £1 shares to ordinary shareholders at the price of 31s. each, in the proportion of one new share to every five held.

Joseph Lucas, Ltd.

Interim dividends are announced of 6d. per share on the 5 per cent. "A" preference shares and 7.2d. per share on the 6 per cent. "B" preference shares, subject to tax.

Mather & Platt, Ltd.

The directors have declared a final dividend of 5 per cent. actual, free of tax, making 10 per cent. for the year, as compared with 15 per cent. (including 5 per cent. bonus) in the previous year.

Northampton Electric Light & Power Co., Ltd.

A final dividend of 6 per cent. is recommended on the ordinary shares, making 10 per cent. for the year.

Rushden & District Electric Supply Co., Ltd.

The directors have recommended a final dividend of 4½ per cent., making 8 per cent. for the year ended December 31st last.

Quebec Power Co.

A dividend of $¼ per share is announced on the common shares for the quarter ending March 31st (same).

St. James' & Pall Mall Electric Light Co., Ltd.

The directors have recommended a final dividend of 9.949d. per share on the £1 ordinary shares, making the standard for the year.

Barcelona Traction, Light & Power Co., Ltd.

The usual dividend of 50 cents per share has been declared on the ordinary shares.

Stocks and Shares.

TUESDAY EVENING.

THE spring season of new issues has started, and the effect of the latest-comers makes itself felt upon prices of existing securities. No little interest continues to be focused upon the possibility of the Bank Rate undergoing a change this month. As previously mentioned, possibilities suggest that the rate may move up to 3½ per cent. before the end of February, owing to the considerable outflow of gold from this country. These considerations influence gilt-edged securities, of which Central Electricity 4½ per cent. debenture is an example. The price has eased off to 94½, a discount of 1. London & Home Counties 4½ per cent. debenture is easier, at 95. London Power 5 per cent. debenture stock has risen ½ to 1¼ premium. The report which came out at the beginning of this week shows satisfactory progress. Increase of output was nearly 12 per cent., and revenue went up by £119,000. Working expenses rose by a little over £4,000. As time goes on, and new issues of stock are made, interest-charges will automatically become heavier, though these should be met easily enough by expansion in the revenue. The company is not permitted to make a profit, as such. Its revenue is applied to satisfaction of the claims of stockholders, and in the service of the industry to which the company contributes so important a part in London.

Gas and Electricity.

The two principal gas companies have been inveighing against the favour shown by national and municipal authorities towards electricity. It is charged against the Minister of Transport that he has come forward as a special pleader in support of electricity. Local authorities of thirteen areas have prohibited the use of gas by their tenants, and in forty-seven areas gas is prohibited for heating and lighting purposes it is said. These protests follow the issue of an interesting brochure by the Gas Light & Coke Company, in which it is claimed that the cry to-day should be gas "and" electricity instead of gas "or" electricity, which some years ago was a more common slogan. From the point of view of Stock Exchange prices, the speeches of the gas companies' chairmen have had no effect, nor are likely to have, upon the course of electricity prices. The ordinary shares in the London group remain very firm, the changes this week being improvements of 6d. each in St. James' & Pall Mall ordinary, to 28s. 6d., and in South Londons to 28s.

Provincial and Overseas.

Bournemouth & Poole are better at 3¼. Egham & Staines at 39s. show no variation, speculative interest in the shares having died down pending some announcement from the company, or from one of the other companies which are supposed to be angling for control. Northampton Electrics are firm at 45s. 6d. In the Indian list, Calcutta Electrics, at 36s. 3d., are now quoted ex the rights to the new shares that were lately issued, one new share in respect of every five old shares, at 31s. These last-named may be obtained at 3s. 6d. premium over and above the 31s. At the moment, there is nothing paid on them, but 11s. is due on acceptance, 10s. on March 18th, and 10s. on April 15th. These rank equally with the existing ordinary shares in respect of the dividend accruing from January 1st this year. Assuming the company to maintain its present dividend and bonus on the increased capital, the yield on the new shares will be a little over 8 per cent. on the money. Lancashire Electric first preference are better at 28s. 6d.

The crisis through which Australia is passing finds reflection in the prices of some of the electrical issues. Adelaide 6 per cent. preference stock, at 85, and the "A" preference stock at the same price are both down 5 points. Melbourne Electric first preference has eased off to 4 11/16; the price of the ordinary stock is quoted at the wide margin of 130 to 150. The last-recorded bargain in this stock was at 176, on March 10th last year. The company's 5 per cent. mortgage debenture stock stands at 91, and the 5 per cent. consolidated debenture stock at 93.

Home Railway Stocks.

The disappointment felt with the announcement of the Metropolitan Railway dividend, making 3¾ per cent. for 1930, as against 4 per cent. in the preceding twelve months, which brought about a fall of 6½ points last week, is beginning to wear off, and the price of the stock is unchanged at 60. This figure is regarded as being reasonable in view of the outlook for the company, and the attraction which the Metropolitan offers to some of the other lines. Underground Electrics slipped back to 23s. on a little apprehension in regard to the maintenance of the 8 per cent. dividend, but Districts are steady at 77. Central London ordinary stocks have improved, the assented strengthening to 80, at which price the return on the money is 5 per cent.

B.E.T. Preferred.

There is on offer £10,000 British Electric Traction 8 per cent. preferred ordinary stock at 134. Dividends are due in December and June, and the yield at the present price comes to 6 per cent. on the money. The dividend requires £107,000, and in last year's accounts the company had £196,000 available to meet it.

Anglo-Argentines Flat.

London tramway issues keep tolerably firm, London United 4 per cent. debenture holding its improvement at 60, although the preference shares at 3s. are 1s. down. In the foreign group, Anglo-Argentine Tramway 5 per cent. debenture stock, which six weeks ago stood at 55, is now about half that price, the fall during the past week being 10 points. The 4 per cent. debenture stock has gone back to 60, the 4½ per cent. debenture stock to 58.

Cables and Wireless.

The feature in the market for telephone and telegraph shares is a sharp rise in Canadian Marconis. This came about on consideration of the statement repeated here last week (Elec. Rev., page 250) referring to the idea of forming a Canadian External Communications Company. From 12s. 6d. the price of the shares has risen to 17s. 6d., support coming from both sides of the Atlantic. Marconi Marines have gone back another 1/16 to 36s. 3d. Cables & Wireless stocks are steady. Globe Telegraph & Trust ordinary shares, at 11, are £1 down.

Hall Telephone Accessories shares rose 2s. 6d. to 17s. 6d. on the excellent report recently published. Postal Telegraph and Cable 5 per cent. gold bonds are up 5 points to 75. The Corporation's 5 per cent. debenture stock stands at 80. American Telephone & Telegraph, at 192¼, is unchanged, and Internationals are better at 27½. The tendency amongst American stocks and shares is stronger as a whole, a number of the United States utility companies receiving a little favour, though interest on this side of the Atlantic remains tepid. There is, however, a fair amount of attention paid to Brazilian Tractions, the price of which has strengthened to 27. Hydro Electrics rose to 29 before reacting to 28½.

Manufacturing Companies.

Callenders at 3½ are 1/16 lower. British Aluminium ordinary further recovered 2s. to 30s. 6d. English Electrics have weakened to 8s. 9d. and 7s. 6d. for the ordinary and preference, respectively. Crompton Parkinson preference gained 6d., rising to 28s. Ever-Ready shares are a little better at 18s. 9d. Philips Incandescent Lamps, at 38s. 6d., have scored a modest gain. In the iron, steel, and allied group Babcock & Wilcox are again harder at 48s. Vickers have gone back to 6s. 7½d.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Feb. 10 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3¼	+1/16	4 16 1
Brompton Ordinary	1	8½	8½	27/6	—	5 1 10
Central Electricity 4½% Deb. ...	Stock	—	—	94½	—½	4 15 3
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	36/3	—	5 10 3
Clyde Valley	1	8	8	34/6	—	4 12 9
County of London	1	7	10	48/9	—	4 2 0
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	48/9	—	4 11 0
Kensington Ordinary	1	8	8	28/6	—	4 18 3
Lancs. Light and Power	1	7½	7	28/-	—	6 1 9
London & Home Counties 4½% Deb.	Stock	—	—	95	—¼	4 14 9
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	42/-	—	4 15 3
Midland Counties	1	6½	7	28/6	—	4 18 3
Mid. Elec. Power	1	15	8	31/3	—	5 2
Newcastle-on-Tyne Ordinary ...	1	6	6	23/9	—	5 1
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref. ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	28/6	+6d.	4 18 3
Scottish Power	1	8	8	30/-	—	5 6 8
South London	1	8½	8½	28/-	+6d.	5 0 0
Urban Ordinary	1	7	7	29/6	—	4 15 0
Westminster Ordinary	1	8¼	8¼	29/-	—	4 16 7
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	34/6	—	4 12 9

Home Rails.

Central London Ord. Assented ...	Stock	4	4	80	+1	5 0 0
Metropolitan	,,	3½	4	60	—	5 16 8
do. District	,	4	5	77	—	6 9 10
Underground Electric	£1	7	8	23/-	—6d.	6 19 2
do. do. Income ...	Bonds	6	6	104	—	5 15 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	25½	+½	5 17 8
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½% Pref. ...	Stock	—	5½	66½	—	8 5 4
do. A 7½% Ord.	,,	—	—	18	+½	... ...
do. B Ord.	,,	—	—	10	—	... ...
Globe Tel. and T. Ord.	10	10	10	11	—1	9 1 10
do. do. Pref.	10	6	6	10½	—	5 17 1
Great Northern Tel.	10	20	20	29	—	6 18 0
Marconi-Marine	1	12½	15	36/3	—1/16	8 5 4
Oriental Telephone Ord.	1	12	12	22½	—	*5 1 1

Home and Foreign Trams, &c

Anglo-Arg. Trams First Pref. ...	5	5½	5½	1	—½	... ...
do. do. 2nd Pref. ...	5	6	6	12/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	28½	—10	17 10 10
British Electric Traction Def. Ord.	,,	5	5	1375	—	... ...
do. do. Pref. Ord.	,,		8	134½	—	5 19 0
Brazil Traction	100	7	8	27½	+2½	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	96½	—	5 3 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60	—	6 13 4
Mexico Trams, 5% Bonds ...	—	5	5	54½	—	9 3 6
Mexican Light Common	100	Nil	Nil	46½	—1	... ...
do. 7% Pref.	100	7	7	66½	—	10 10 0
do. 1st Bonds	—	5	5	78	—2	6 8 0
Victoria Falls Ord.	1	15	15	58/9	—	5 2 0
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	21/6	—6d.	5 11 7
Babcock & Wilcox	1	18	15	48/-	+6d.	*6 5 0
British Aluminium Ord.	1	10	10	30/6	+2/-	6 11 2
British Insulated Ord.	1	15	15	3⅝	—	4 10 7
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	3½	—1/16	4 16 1
do. 6½% Pref.	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	23/3	—	6 9 0
do. 8% Pref.	1	8	8	28/-	+6d.	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5½	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	4⅞	—	5 16 0
English Electric	1	Nil	Nil	8/9	—1/16	... ...
do. Pref.	1	3	Nil	7/6	—1/16	... ...
Ferranti Pref.	1	7	7	21/6	—	6 10 4
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	10	14	45/-	—	6 1 0
Henley	1	25	30	51½	—	5 1 0
do. 4½% Pref.	5	4½	4½	4⅝	—	5 2 10
India-Rubber	1	Nil	Nil	6/3	—	... ...
Johnson & Phillips	1	10	10	36/9	—	5 8 10
Siemens Ord.	1	7½	7½	1⅛	—	7 1 2
Telegraph Construction	12	10	10	16½	—	*7 5 6

*Dividends paid free of Income Tax.

The British Industries Fair—I.

Some Notes on the Electrical Exhibits and Functions at Castle Bromwich, Birmingham.

THE seventeenth British Industries Fair opens on Monday next at Castle Bromwich, Birmingham, and, in London, at Olympia and the White City, remaining open until February 27th. It is the first-named section which is of principal interest to our readers, there being a special Electrical Section at Birmingham; there is a certain amount of electrical and radio equipment on view at Olympia, while the White City section is devoted to a British Cotton Textile Exhibition with which we are not directly concerned.

At Birmingham the exhibitors whose displays are of an electrical nature, or include electrical apparatus, number about 130, roughly 14 per cent. of the total number of stands. In addition to these, about 60 firms are showing electrical products at Olympia, mainly of the smaller classes.

The contribution by the electrical industry to the Castle Bromwich display is fully representative of the industry's important position in the modern commercial and industrial world. There is abundant evidence of the noteworthy advances which have been made comparatively recently in the domain of industrial electrical heating, and, on the domestic side, appliances for cooking and heating show a striking numerical increase. It is to be noted, moreover, that the policy of standardisation is receiving more attention from manufacturers.

In our last issue we published a programme of the electrical functions which are to be held during the next fortnight, but we may be permitted to refer briefly to the matter in these notes. The principal "electrical" days are Thursday next, February 19th, when representatives of the leading traders' and other associations will pay an official visit, and Tuesday, February 24th, which will be mainly a "supply" day, concluding with a dinner arranged by the British Electrical Development Association at the Queen's Hotel in the evening. At this dinner Ald. E. Huntsman, the president, and Mr. A. C. Cramb, the new director and secretary, will be the principal speakers. We are informed that there has been a good response to the invitations to the dinner, and a large and representative gathering is assured.

The City of Birmingham has again timed the new edition of its useful handbook to appear immediately before the opening of the Fair. This 288-page volume is a most exhaustive guide to Birmingham and district and a compendium of interesting data regarding civic activities. The photographic illustrations are excellent.

In this issue we commence a review of the principal electrical and allied exhibits, which, as will be seen from this introductory selection, cover a very wide range.

Some of the Exhibits.

A First Instalment of Illustrated Notes.

The "Electrical Review" Stand.

As last year, the ELECTRICAL REVIEW has taken space at Castle Bromwich, and has a stand (No. 20 G/4) in the Electrical Section. There members of our staff will be in attendance during the Fair, and they hope to meet many of this journal's friends. Electrical exhibitors and visitors are asked to avail themselves of any assistance of which they are in need and which we are in a position to render.

The stand is illuminated by means of "Pastelite" fittings supplied by Messrs. Osler & Faraday, Ltd. These are of very attractive design and employ a delicate colour scheme.

Carron Company.

Carron Company devotes a portion of its stand to a display of domestic electric cooking and heating appliances of which several are on view for the first time. Imitation coal fires, with realistic flicker, flame and smoke effect, and giving the cheerful glow associated with the coal fire, are shown. Special attention is being drawn to the finish of these fires, particularly those in art gold, art silver and art copper—finishes which cost no more than the ordinary black finish. Examples of the "Carreflex," "Cathedral," and "Stella" fires are on view in a wide variety of styles including the "Canterbury" in a chromium-plated fabric finish.

In addition to its standard cookers, the company shows some new smaller types which embody many interesting features. The small upright model has been designed with the idea of making it easily convertible into a table model by lifting the hob complete and mounting it alongside the oven unit—the two being fitted on to a table or stand, bringing the oven and the hob to a convenient working level. The overall dimensions are: Height, floor to hob, 34 in.; width, 22 in.; and depth, 16 in.; and longer legs can be fitted to give a height of 41 in. to the hob. The oven is side and bottom heated. The side element guard and shelf runners are pressed out in one piece and these are hinged allowing them to swing out and also to be easily removed, and there are several other improvements.

H. H. Vivian & Co., Ltd.

Many of this company's products are of special interest to the electrical industry, as they are the semi-raw materials from which much of the apparatus is produced. Included among the exhibits are brass, copper, and nickel-silver sheets and wire, high-conductivity copper strip and tubes for use as busbars, &c., and copper and brass tubes for general purposes. Tubes for the condensers of generating plant are available in all alloys, including brass, Admiralty mixture, cupro-nickel, aluminium-brass, and the company's special "Improved Durable" alloy which is exceptionally resistant to corrosion.

Le Carbone, Ltd.

This company is exhibiting "AD" primary cells and batteries suitable for a wide range of uses. Air depolarising cells are being shown in both wet and dry form for railway purposes such as track circuits, signal motor operation, automatic blocks, and colour light systems. Batteries for telephone switchboards, mine signalling indicators, switch tripping gear, and wireless service, as well as the usual industrial intermittent service requirements, are also well represented.

The S.W. & S. Power Co.

As in previous years the Shropshire, Worcestershire and Staffordshire Power Co. has provided an information bureau at which information concerning the area served can be obtained. This year the company's new associate, the South Wales Electrical Power Distribution Co., is participating in the display. The stand is of a very modern character both with regard to design and lighting. The publicity matter available describes the facilities offered in the area of the company and the South Wales Company for industrial enterprise.

Bulpitt & Sons, Ltd.

This company is showing a full range of electric cooking utensils, including improved models of electric kettles having renewable immersion elements. Chromium plating has now become a feature of the latest appliances. A new type of car heater called "Willy the Warmer," which is being shown, has many novel points. It is protected by miners' copper gauze vents and petrol can be poured upon it without risk of ignition after a period of three hours on circuit, after which time it may be safely said to have attained its maximum temperature. Also of interest is the range of flat-bottomed utensils for use on an electric hot plate. These utensils have ¼-in. aluminium bottoms which are specially designed to give maximum contact and withstand distortion

Record Electrical Co., Ltd.

The exhibits on this stand cover a wide range of ammeters, voltmeters, insulation-testing sets, electrical tachometers, circuit breakers, &c. They include a complete series of the company's "Cirscale" instruments, moving-coil and moving-iron types, for d.c. and a.c. circuits. Both types have a circular scale and a pointer which deflects through an arc of approximately 300 deg. Another interesting exhibit is the "Cirscale" workshop ohmmeter having three ranges, fig. 1, the chief advantages being direct reading, no calculations, quick action, and "dead beatness." The indicator, reading direct in ohms, is complete with a special resistance box having a Wheatstone bridge circuit, voltage regulator, and test switch. It has a 16-in. scale, differences of 1 per cent. ohmic value are discernible, and calibration is accurate to within 2 per cent. on any part of the scale. Among the insulation and resistance testing instruments exhibited is a new model ohmmeter (light-weight) reading up to 2,000 megohms, complete with a 1000-volt constant-pressure generator. It has a strong teak case with special carrying handle. Other portable instruments include precision moving-iron voltmeters for a.c. testing, with negligible frequency errors up to 1,000 cycles, complying with B.S. Specification for sub-standard accuracy. Two types of change-coil portable instruments are also shown—a combined voltmeter and ammeter and a multi-range ammeter. The company also manufactures a range of ratiometers for a.c. and d.c., for use as helm indicators, valve position indicators, or switch positions for transformer tappings, &c. "Cirscale" electrical tachometers are supplied for use in workshops, ships, and aircraft. The apparatus, which consists of a "Cirscale" voltmeter calibrated in conjunction with a magneto generator giving an output of one volt for 30 r.p.m., makes a very convenient distant indicator. A considerable amount of progress has been made in connection with the Record single, double, and triple-pole circuit breakers for alternating current, varying in capacities from 15 to 2,000 amperes. The breakers are of robust design and liberally rated; the mechanism is a simple toggle action operated by a catch and roller. A loose handle feature is provided to prevent the breaker being closed or held closed on an overload. The brush is a special feature, being self-aligning in all directions, and it can readily be removed for replacing.

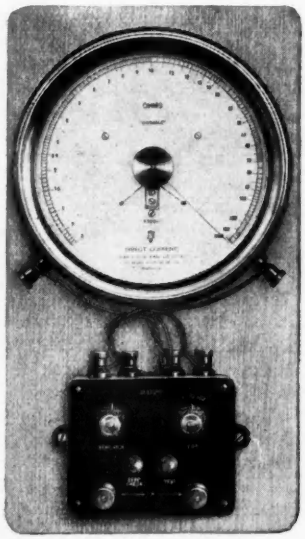


Fig 1.—The "Cirscale" Workshop Ohmmeter.

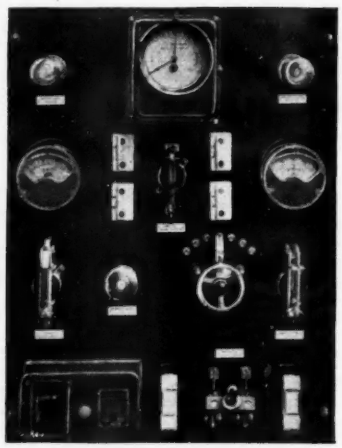


Fig. 2.—An Automatic Emergency Lighting Switchboard for Ships.

Ray Engineering Co.

This stand is devoted entirely to l.p. switchboards and switchgear. A most comprehensive display is on view ranging from small battery-charging resistance units to elaborate all-steel industrial switchboards. Totally-enclosed metal-clad lighting plant switchboards are well in evidence and a new and improved type is being shown for the first time. A recent development is an entirely automatic ship's emergency lighting switchboard (fig. 2) for changing over to an emergency battery should the main supply fail. An all-steel enclosed switchboard is again being shown as the demand for this class of apparatus has been very considerable, especially for use in kinemas and theatres.

Ebonestos Insulators, Ltd.

This stand bears a comprehensive selection of mouldings in bakelite and other synthetic resins, black, ivory, white, and coloured. There are also sample mouldings in various grades of "Ebonestos," having heat, alkali, acid, and oil-resisting properties. The exhibits are designed to illustrate the range of mouldings produced for electrical manufacturers.

G. A. Harvey & Co. (London), Ltd.

Of outstanding interest on this stand is the extensive range of perforated metals for sorting, grading, screening and filtering purposes. Examples of ornamental perforated metal work, radiator covers, grilles, ventilator panels and pipe guards, suitable for use in ships, hotels, mansions, offices, &c., are also fully represented, as well as specimens of steel filing cabinets, cupboards, tables, &c.

Vac-Tric, Ltd.

In addition to the display of "Vac-Tric" vacuum cleaners, which are equipped with a disinfecting device, this company is exhibiting a range of motors from 1/100th to ¼ h.p. By the courtesy of Messrs. Creed & Co., Ltd., two Creed teleprinters are shown in operation driven by "Vac-Tric" 1/12-h.p. motors. The company states that it is the sole supplier of motors for use in conjunction with these instruments. This is the first occasion upon which the company has exhibited electric motors which it is now producing on mass production lines.

Ferguson, Pailin, Ltd.

The whole of this large stand is devoted to the display of the company's new range of round-tank oil circuit-breakers, together with a number of units incorporating this type of breaker. On a circular platform a type "R36" breaker is mounted, the top plate being raised out of the tank and supported by a pillared framework. The breaker is shown with the contacts opening and closing. Above the breaker the "F.P." monogram is built up of a number of the company's standard lamp type semaphore indicators in operation, the red light indicating the "on" position and green light the "off" position of the breaker. At the rear of the stand to the left is situated a "Type VTR.36," while balancing this on the right hand there is a "VTR.28" unit. Both of these are of duplicate busbar metal-clad design, incorporating round tank breakers and oil-circuit-breaker trucks. Fig. 3 illustrates a "VTR.36" unit showing the disposition of the round-tank breaker and the potential transformer together with integral screw-raising and lowering mechanism. In addition, a breaker truck of an entirely new type and incorporating motor-operated raising and lowering gear is on show. A "Type BV" draw-out enclosed switch unit is situated between the two metal-clad units. The "BV" is a complete ring-main arrangement of a very compact and accessible nature. The office contains a display of photographs which, together with those displayed on three revolving stands indicate the extent of the service offered by the company. Two gunmetal pillars with apertures contain stereoscopic photographs of the company's works and processes. A third pillar, surmounted by a glass dome, provides a demonstration of the flexibility of the standard "F.P." contacts, while a similar pillar illustrates the operation of auxiliary contacts. A fifth novel exhibit shows the company's patented plug-and-socket arrangement, as used on its vertical isolated metal-clad gear.

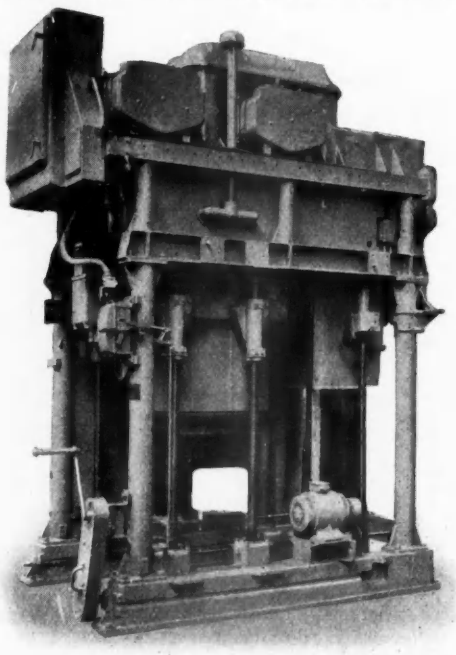


Fig. 3.—A Large "F.P." Switchgear Unit.

A. Reyrolle & Co., Ltd.

One of the principal exhibits on this stand is a "Type C3" metal-clad horizontal draw-out switchgear panel; panels of this type are rated for currents ranging from 300 to 600 A, at pressures up to 12,000 V. The fixed back portion of the panel, consisting of a bus-bar chamber mounted above a current transformer chamber, has deeply recessed orifices with suitable insulators to separate the contact sockets. Corresponding self-aligning plug contacts are fitted to the movable circuit-breaker carriage to engage with these sockets. Red and green indicating lamps are fixed to the side to denote the position of the circuit-breaker. The circuit-breaker top-plate is supported on rollers, and a rack-and-pinion device is provided to facilitate its withdrawal and replacement. Locking-off

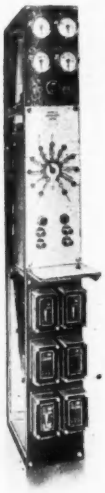


Fig. 4.—The Reyrolle "Centrovisory" System.

Fig. 5.—The Holmes Traffic-control Apparatus.

doors are fitted which automatically cover and prevent access to any live parts exposed by the withdrawal of the circuit-breaker. In the exhibit the front side of the metal switch-tank has been removed, and in its place a thick sheet of clear glass is fitted so that the plunger bar and contacts can be seen in operation. Simple mechanical interlocks are embodied to prevent incorrect sequence of operation.

The company also shows a "Centrovisory" control equipment for large power schemes (fig. 4). The equipment comprises a control panel, which would be situated at a central control point, and a controlled panel, which would be situated at a remote controlled point. These panels would be interconnected through pilots, and the principle underlying their construction is one of eliminating multitudinous relays and contacts, and substituting for them robust and simple mechanism to perform the required functions. The basic feature of the equipment is the rotation of two contact-making drums—one contained in each cubicle—which ensure step-by-step synchronism by positive interlocking in a definite electrical sequence.

Messrs. Reyrolle exhibit examples of their detachable cable dividing boxes, known as "Flit-Plugs." These are metal-clad and are liberally designed so as to withstand the rough usage generally experienced in the mining industry; and their principal use is in extending and linking up cable to gate-end switchgear or other such apparatus.

Another exhibit is a new air-break reversing switch, which has been specially developed for use in conjunction with electric drilling machines. The arrangement consists of a three-pole 15-A, 250-V double-throw switch and three single-pole cartridge-type fuses in a robust cast-iron case. An incoming cable dividing box fitted with a detachable sealing gland is mounted on top of the switch casing, and a three-pin-and-earth plug and socket is provided for the outgoing cable. The plug is mechanically interlocked with the switch handle.

A 100-A "MK1" metal-clad portable circuit-breaker represents the company's smaller mining switchgear.

Messrs. Reyrolle are showing a complete range of the single tubular immersion heaters which they have recently developed. These are manufactured in seven sizes, ranging from .75 kW to 6 kW capacity, and are suitable for use on circuits up to 500 volts a.c. or 250 volts d.c. A sample of a bank of 30 kW rating mounted on a circular flange plate is exhibited.

Messrs. Reyrolle have co-operated with Messrs. G. N. Haden and Sons, of Manchester, and have installed on the Birmingham Corporation stand a model heating scheme, using an electrical thermal-storage system. The equipment consists of a heater-tank, a storage-cylinder, pipework and radiators, and a control panel. The heater-tank is provided with a 15-kW bank of tubular immersion-type heaters connected to the three-phase supply, which is at 440 volts, 25 cycles. The storage-cylinder has a capacity of approximately 700 gallons, and is fitted with a thermostat.

J. H. Holmes & Co., Ltd.

This company is showing on the same stand as Messrs. Reyrolle, with whom they are associated, a set of all-British automatic street traffic control apparatus. The lamp-boxes are of welded sheet-steel construction, and are fitted with hoods which effectively screen the glasses from the sun's rays, and thus prevent the possibility of phantom signals being produced by reflection. Special diffusing glasses are used, and chromium-plated concave reflectors are mounted behind the signal lamps. Each box is capable of rotation about its vertical axis to allow of adjustment on site to suit special conditions, and brackets for pole-mounting are available to accommodate the necessary boxes for one-way, two-way or three-way control. The control apparatus (fig. 5) is housed in a cast-iron box, which has two compartments; one contains all the mechanism including the driving motor, protecting fuses and isolating switch contacts, while the other contains the control handles and levers only.

Messrs. Holmes & Co. also show some examples of their wide range of electric motors. These include two three-phase squirrel-cage induction motors, one of flameproof design, and the other totally-enclosed external-fan-ventilated. A variable-speed motor of the alternating-current commutator-type is also shown.

E. Elliott.

This firm is exhibiting mouldings in bakelite, including examples of components which it has made for various manufacturers of electrical goods. It does a large amount of moulding for the electrical industry.

Electrical Power Engineers' Association.

This year the Association's stand takes the form of a lounge, to be used as a rendezvous for members and their friends visiting the Fair, and the stand has been designed mainly as a means of bringing to the notice of those connected with the electricity supply industry the Association's official organ, "The Electrical Power Engineer." Provision has also been made for a display of technical publications by leading publishers, and of technical literature dealing with manufactures and apparatus of the foremost electrical engineering firms in the country. An official will be available on the stand throughout the Fair for the purpose of interviewing members, potential members, and any other person interested in the Association and its activities.

British Thomson-Houston Co., Ltd.

This year the B.T.-H. Co.'s exhibit is devoted exclusively to "Mazda" lamps and, once again, the well-known "dancing girl" is the central figure of the display. An illustration showing the arrangement of the stand appears herewith (fig. 6). Apart from the very unusual nature of the counters, which consist of two converging lines of triangular sections of diminishing size, the material of which they are made is also novel. These counters are illuminated from within; they are made of a new translucent material which gives the effect of glass, without its fragility. The whole of the lighting of the stand is arranged on four circuits, employing "Mazda" colour-sprayed lamps of four different colours. These circuits are connected to a motor-driven dimmer and the effect thus obtained is singularly beautiful. "Mazda" lamps of practically all types, with one or two exceptions, are displayed on the illuminated counters.

Fig. 6.—The B.T.-H. Stand.

British Engineering Standards Association.

The Association, as usual, shows the full range of available British Standard Specifications which have been prepared by the various sections of the organisation.

S. & W. (Lighting), Ltd.

Lighting glassware to suit all tastes and requirements for domestic and commercial use appears on this stand. It covers a very wide range of shapes and effects, including a special display of cube and tube glassware, and a large variety of colours.

Hugh J. Scott & Co. (Belfast), Ltd.

One of the principal exhibits of this company is a vacuum cleaning plant (fig. 7) designed specially for use in weaving factories, spinning mills, laundries, bakeries, flour mills, railway and 'bus depôts, &c. It is provided with special fittings to carry all the equipment including vacuum heads, extension tubes, pipes, cable, &c. The motor, which is of 2 b.h.p., is of the heavy duty type, suitable for continuous running. The whole plant is carried on a rigid aluminium baseplate chassis fitted with ball and roller bearing rubber - covered wheels. The dust bag is of large capacity and is fitted with a lightning fastener for easy removal of the dust.

Fig. 7.—A Scott Industrial Vacuum Cleaning Plant.

The company's "F" type slipring induction motor is of robust construction. The end frames are specially designed to give ample ventilation of the windings, and are fitted with inspection ports for testing air gap clearance. The terminal box is mounted in such a position that the incoming cables can be connected up to the terminals with the greatest ease. The rotor spindle is of large diameter and is mounted on ball and roller bearings. A complete range of these "F" type machines is shown, together with part of a range of new "K" type d.c. motors, motor-generator sets and inverted rotary convertors. Two of the "F" type machines are mounted on revolving pedestals at either corner of the stand. The vacuum plant is being demonstrated continuously.

Aerograph Co., Ltd.

A complete range of spray-painting equipment is shown on the stand of this company. The exhibit includes two new light portable plants—the "Whippet" and the "Greyhound." The "Whippet" plant (fig. 8) embodies an air compressor of ample capacity, driven by a ¼-h.p. electric motor which can be plugged-in and operated from an ordinary electric light fitting. The "Greyhound" plant is designed for larger and more continuous work than the "Whippet" and is driven by an electric motor or by a petrol engine in cases where a convenient supply of electricity is not available. In addition to its spray-painting plant the company is displaying a comprehensive range of samples showing some of the finishes that may be obtained with the Aerograph spray gun.

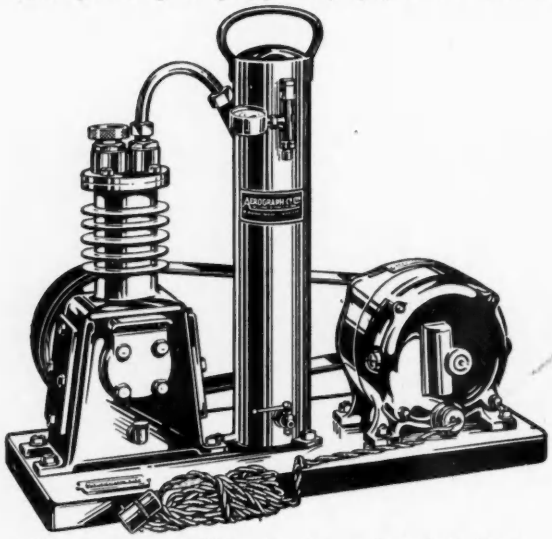


Fig. 8.—The "Whippet" Spray-Painting Plant.

Sturtevant Engineering Co., Ltd.

Portable and stationary turbine vacuum cleaners and plant for the rapid and thorough cleaning of industrial and business premises of all types are being shown on this stand. These machines and sets range from ¾ to 100 h.p. or more, and some of the smaller machines will be demonstrated in actual use. "Sturtevant" turbine vacuum cleaners are used in almost every kind of industry and particularly in foodstuff factories, large warehouses, chemical works, electrical industries, and also for the collecting of flue dust from boilers. A working installation of "Sturtevant" pneumatic tubes for dispatching cash messages, papers, and documents of all kinds from one place to another can be seen, as well as demonstrations of the "Croydon" household type vacuum cleaners. Another exhibit of interest is an exhauster shown in the accompanying illustration (fig. 9).

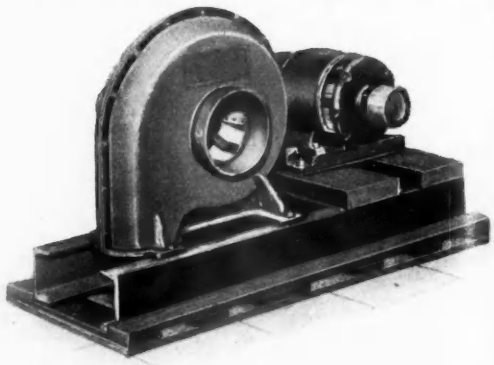


Fig. 9.—A "Sturtevant" Exhauster.

Davidson & Co., Ltd.

This year Messrs. Davidson & Co. are making a special feature of air-conditioning plants. The "Sirocco" air-conditioning unit shown in operation on the stand (fig. 10) demonstrates how it is possible to furnish an air supply at a constant fixed temperature and a definite moisture content. The unit comprises a preliminary air heater, spray water heater, air washer, main air heater, and fan. The preliminary air heater raises the temperature of the incoming air to a predetermined degree above freezing point. In passing through the fine mist in the spray chamber of the washer the air is not only cleansed of its impurities, but acquires also a state of high relative humidity. Any alteration in the temperature is instantly transmitted by a thermostatic regulator to the diaphragm valves on the preliminary heater and spray water heater which open to admit more steam or close according to requirement. In the "Sirocco" air washer all free moisture in the air current is eliminated, and all risk of trouble due to entrained water is obviated. Upon leaving the washer the air is re-heated by the main heater to a predetermined temperature which automatically gives the required humidity. This temperature is kept constant by a second regulator. Impulse is given to the

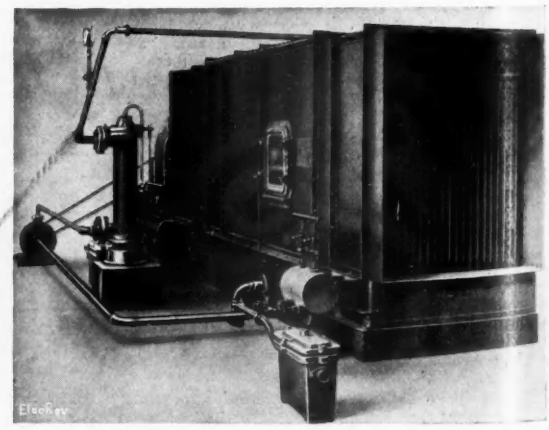


Fig. 10.—A "Davidson" Air-conditioning Unit.

valves and the regulators through the medium of compressed air from a small compressor unit. The plant has many industrial applications.

A "Sirocco" steam turbine heater unit is shown in operation, and another notable exhibit, of particular interest to power station engineers, is the wheel of a "Sirocco" induced draught fan complete with its bearings. The wheel is 80 in. in diameter and is one of 48 "Sirocco" mechanical boiler draught fans on order for the Battersea power station. The fan is designed to deal with 51,500 cu. ft. of gases per minute against 15¼-in. water-gauge.

Marshall, Sons & Co., Ltd.

The exhibits of this company consist of four "Marshall" Diesel tractors and one Diesel cold-start oil engine. Two of the tractors shown should prove most serviceable for the transport of electrical plant where high road speeds are not essential. As to the oil engine (fig. 11), this includes all the latest refinements applicable to its class, and is most economical in fuel consumption. It will work successfully on any of the crude, residual, tar or refined oils obtainable and will start instantly from cold.

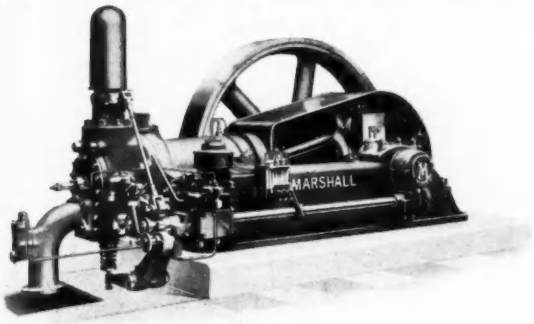


Fig. 11.—The "Marshall" Diesel Cold-start Engine.

British Insulated Cables, Ltd.

A selection of the latest types of butt, spot and seam welders appears on this stand. It includes a new seam welder (No. 102L) suitable for drum or bucket making; a new butt welder (No. 101), designed for welding fine copper wires down to 30 SWG. (.0124 in. dia.); and an automatic butt welder (No. 92) for sections up to 2 sq. in. A 3-head 30-kW rivet heater of the latest pattern, designed to heat rivets up to 1 in. dia., is another exhibit. All of these are shown in operation. Another section includes a new range of underground cable boxes, including network and service boxes; the latest type of "Prescot" feeder pillar with improved unit; and examples of the latest B.I. standards of pole-line construction.

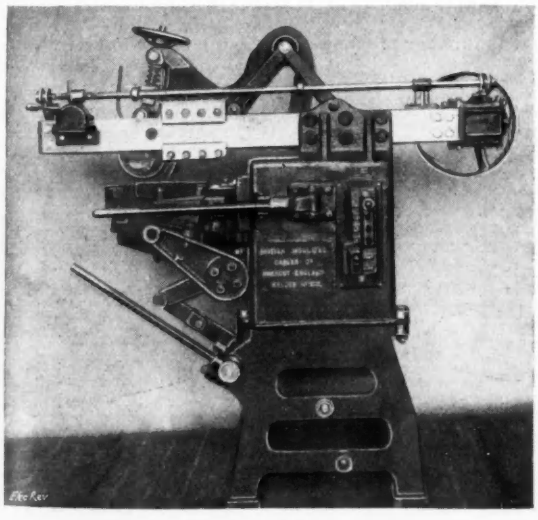


Fig. 12.—A "Prescot" Seam Welder.

In the fitting of the stand itself liberal use has been made of the copper and aluminium sheets, matting, mouldings, &c., produced at the Prescot Works of the company. The office is entirely sheeted with metals, the roofs being covered with "Prescot" roofing copper in the "Council roof" style, while B.I. glazing sections are used for the window.

An electro-magnetic moulding machine developed by the B.I. and tested during the past two years in the company's foundry at Prescot is exhibited by Pneulec, Ltd. Great rapidity of action, simplicity of operation, and low cost of power and maintenance are claimed for this. Among other exhibits are bare and covered wires, extruded sections, meters, cutouts, and other accessories, primary batteries, static condensers, solders, soldering paste and paper pinions.

The No. 102L welder referred to above is illustrated in fig. 12. It consists of a 15-kW single-phase static transformer enclosed in a cast-iron body mounted on cast-iron legs. The top electrode consists of a copper roller 7 in. dia. by 1 in. face with a welding path about ¼ in. wide. This electrode is hinged on to a travelling carriage operated by a screw. Motion is transmitted from the driving pulley to the screw through a gear box and reversible clutch. The clutch is closed by a hand lever fitted on the front of the carriage rails and is opened automatically at each end of the travel. The bottom electrode is of the fixed rail type. Mechanical pressure is applied to the weld by an adjustable compression spring, adjusted by means of a knurled nut and a hand wheel is provided to raise and lower the top electrode. Eight heating speeds are provided through the medium of a plug box.

Bakelite, Ltd.

This company is showing at both London and Birmingham. In each case the exhibits are arranged to give a practical demonstration of the utility of Bakelite wall panelling; each stand is built of this material, resembling highly polished wood grain finishes. The various forms of Bakelite materials are exemplified by samples of products which embody these. For the first time laminated Bakelite panels on metal sheets are shown, and Bakelite laminated in white marble sheets is also on view. Other new products include various types of Bakelite varnishes and resins.

The Gutta-Percha Company.

This branch of the Telegraph Construction & Maintenance Co., Ltd., has an exhibit consisting of magnetic alloys and high-resistivity heat-resisting alloys. The magnetic alloys comprise the high-permeability alloy "Mumetal" which is now used in the leading makes of instrument transformers, and "Radiometal," the high-permeability nickel-iron alloy for transformer cores. A feature of this year's exhibit is the improved quality of these alloys. Sheets are exhibited up to 30 in. wide by .014 in. thick. The heat-resisting alloys are comprised of the "Pyromic" range, which are pure nickel-chromium and nickel-chromium-iron alloys melted in induction furnaces. The company is also exhibiting, for the first time, a new alloy in this class—"Feralloy," which possesses all the qualities of nickel-chromium alloys with the advantages of high resistivity and lower primary cost.

"Beeantee" Illuminations, Ltd.

The exhibits of this company comprise various types of "Beeantee" lighting strip holders, including the standard bayonet cap model, the "Edison" screw model with extra weatherproof shield, and the shade carrier model, all of which can be used for all kinds of permanent and temporary installations and illuminations. Demonstrations of special trough metal sign letters are given, showing how a two-foot sign letter can be wired with "Beeantee" holders in a few minutes without any cutting, &c. Also to be seen is a good selection of illuminated crowns, stars, and special futurist designs, bakelite mouldings, and accessories.

Moulded Products, Ltd.

Among a large selection of mouldings for the electrical and kindred trades, there is a particularly interesting exhibit of the mouldings used in the new G.P.O. "Neophones" manufactured by Messrs. Siemens Bros. & Co., Ltd. The accompanying illustration (fig. 13) shows one of the automatic-type "Neophones." Also to be seen on this stand is a range of "M.P.L." moulded bakelite table lamps in a number of very pleasing colours.

Fig. 13.—An Automatic "Neophone" incorporating "M.P.L." Mouldings.

Brownie Wireless Co. of G.B., Ltd.

Numerous examples of moulded parts, including electrical components, appear on this company's stand.

Micanite & Insulators Co., Ltd.

This company's exhibit includes a comprehensive display of the various electrical insulating materials used in the manufacture of electrical plant and apparatus and a range of high-voltage condenser bushings for outdoor service, both on transformers and oil circuit-breakers.

Examples of bushings for various pressures are shown, including 132-kV outdoor transformer bushings manufactured for use on British transformers constructed for the Grid. Also displayed is a 132-kV wall bushing, one of an order received from Canada.

A complete range of micanite insulation, including commutator segment micanite and micanite end rings, is to be seen, together with similar articles manufactured in "Glyptanite." Many of the applications of varnish-paper tubes are demonstrated, and a collection of "Paxolin" varnish-paper boards is shown, including heavy panels for control gear and the thin material used for punching. Examples of articles machined from these boards are on view, together with some of the applications of varnish-paper to radio work.

Morgan Crucible Co., Ltd.

As a demonstration of radiant heat, this stand, which has a floor area of 20 ft. by 25 ft., is heated by means of five of the company's "WFC" type radiators and a combined heating and lighting pendant in the centre, controlled by a Morganite radiation thermostat (described in our issue of August 22nd last, p. 319). This instrument differs from all other instruments for the automatic control of heating installations, in that it maintains at a constant value the heat loss from the human body, which is synonymous with the state of comfort. It comprises a sphere 6 in. diameter heated by means of a constant input of about 6 W, which, in comfortable conditions, will maintain the sphere at the same temperature as the human body. A thermally-operated switch is incorporated inside the sphere, which controls the heating installation in such a manner as to maintain the sphere at the correct temperature. In certain cases, it is either advisable or necessary to mount radiant heaters overhead. Where appearance is of importance the heating elements may be incorporated in the lighting pendants. Examples of this kind of unit are exhibited.

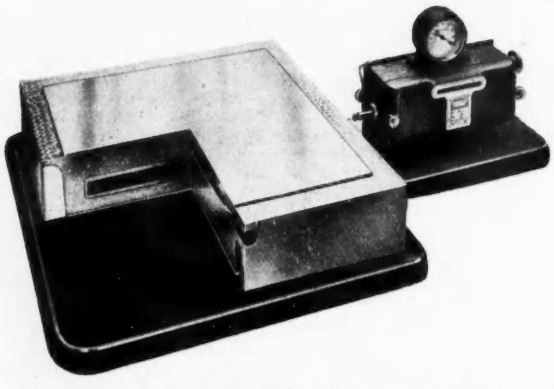


Fig. 14.—Section of a "Morganite" Bakelite Press.

The distribution of the radiating surface is of the first importance, and to demonstrate the influence of this factor a model is shown. Radiant heat differs from visible light only in wavelength and in this scale model the radiators are arranged to emit visible light, white prisms being used to enable the radiation from any direction be estimated.

A sectional model of a bakelite press (illustrated in fig. 14) is shown. In order to obtain metallic conduction of the heat, the "Morganite" element is cast into position with lead. This method of heating has given complete satisfaction over a number of years and has been standardised by the leading press manufacturers. An actual press in operation, heated in this manner, may be seen on the stand of Messrs. Taylor and Challen, among other firms. The "Morganite" hygrostat is shown for the first time. It consists of a differential thermostat operating on the well-known wet and dry bulb thermometer principle; it is used primarily for the prevention of condensation in buildings containing electrical machinery, &c. A full range of "Morganite" electric radiators and thermostats is also on view. These include examples of a new line of radiators, to be known as the "R" type. These differ from the company's standard type only in that the reflector plate behind the element is replaced by means of a heat insulating block, which, by still further reducing the heat transfer from the back of the element, increases the radiant efficiency. The loading is arranged to give the same quantity of radiation as the standard type, but with a considerably reduced input. Furnaces are represented by examples of high-temperature heating elements 7 ft. long by 18 in. wide, similar to those employed in the tunnel kiln of Messrs. Doulton & Co., Ltd. A Morgan's "ladling-out" furnace for melting or maintaining at casting temperature, 300 lb. of aluminium, is exhibited, together with a quarter-size model of Morgan's patent tilting furnace, type "CA" for oil fuel. Other exhibits include refractories, combustion and pyrometer tubes, insulating tubes for thermo-couples, and electric furnace linings.

G. D. Peters & Co., Ltd.

This company is displaying all the latest models of "Wilson" elastic arc welders. Fig. 15 shows a special multi-operator set for production work, accommodating three operators. One motor-generator set supplies electricity to all the operators through a patent "Wilson" automatic current-control panel—each operator being able to regulate the supply required, independently of the others.

A portable single-arc petrol-driven plant, having a "Dorman" four-m.v.e. four-cylinder engine, is also fitted with an automatic control panel and represents the latest development in robust construction and efficient working. A special 100-A welder, designed for the use of garages and small engineering works, is being demonstrated.

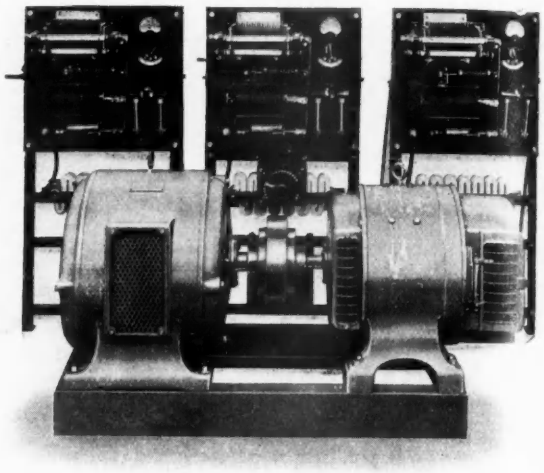


Fig. 15.—A "Peters" Multi-operated Welding Set.

All grades and sizes of colour-tint welding metals are shown, and visitors are offered the opportunity of trying out any wires in which they are interested. Special attention has been given to wires for the welding of stainless steel. Welding screens, lenses, welders' gloves, electrode holders, wire brushes and other accessories are also included in this display.

Wm. McGeoch & Co., Ltd.

This exhibit comprises electric lighting fittings and accessories, switch- and fusegear, "lock-up" type electrical fittings, and brassfoundry suitable for ships, railways, tramways, public buildings, factories, mines, &c. The switchgear shown includes knife switches, unit-type switchgear, ironclad switch- and fusegear, and a range of "Warwick" self-aligning H.O. fuses. Fig. 16 illustrates one of the exhibits, a unit-type ironclad switchboard. Lighting fittings of modern style and original design are shown; they include pendants, roof lights, wall brackets, and table and floor standards. There is also a range of lampholders. Among the ships' electrical fittings is a

Fig. 16.—A Unit-type Ironclad Switchboard.

"Warwick" type ship-light indicator. This gives audible as well as visual indication of failure of any of the navigation lights, or the blowing of the fuse. Other items under this heading include ships' navigation lamps, watertight plugs and sockets, watertight combined switches, sockets and plugs, morse code signalling apparatus, "Klidos" cargo connection boxes and plugs, for ship and dock use, and ships' interior fittings.

Thos. de la Rue & Co., Ltd.

Messrs. de la Rue are exhibiting a very comprehensive range of mouldings, applicable, primarily, to the electrical trades and the associated industries.

In addition to the well-known "Telenduron" telegraph and telephone line insulators, telephone instrument mouldings, cable terminal boxes, battery containers for motor-car work, containers for radio, including the substitution of moulded grilles for plywood are on view. The company's speciality is principally demonstrated by large-sized mouldings, two of which are illustrated in fig. 17. The ring is about 3 ft. 4 in. in diameter. Mouldings up to 3 ft. 9 in. diameter are exhibited.

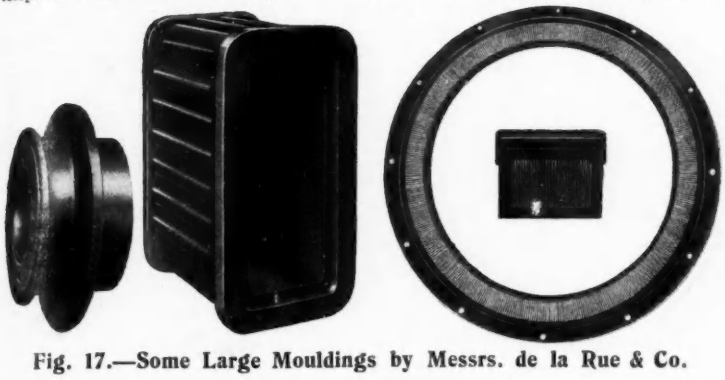


Fig. 17.—Some Large Mouldings by Messrs. de la Rue & Co.

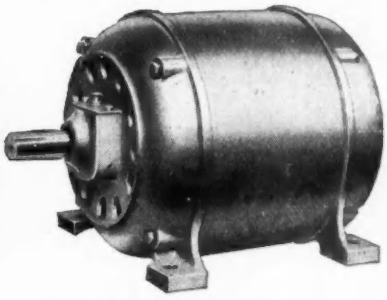


Fig. 18.—A Berkeley & Young Repulsion-induction Motor.

Berkeley & Young, Ltd.

Messrs. Berkeley & Young are again exhibiting a comprehensive range of electric fans, including ceiling, box, and propeller-blade exhaust, marine, domestic desk and bracket, universal and oscillating types, and a specially-designed exhaust fan for use in refrigerators. The company's commercial fans are former wound and carefully impregnated for tropical service; the oscillating fan gearing is of ingenious and simple design and is provided with a slipping clutch to prevent damage to gears. The company has recently developed a new range of a.c. and d.c. fans in connection with cellulose spraying; these are entirely fume-proof and meet Home Office requirements. For the past 20 years the company has manufactured large repulsion-induction motors, and it has now produced smaller sizes ranging from ¼ to 1½ h.p Incorporated in these is a brush-lifting and short-circuiting mechanism, the bearings are yarn-packed and are silent in operation. One of these motors is illustrated in fig. 18. For small refrigeration work a special repulsion-induction motor has been produced. This is rubber mounted to secure more silent running. Messrs. Berkeley and Young manufacture the "Bandy" repulsion lift and crane motor.

Fig. 19.—The "Davidson" Toaster.

Fig. 20.—The "Goblin Wizard" Cleaner.

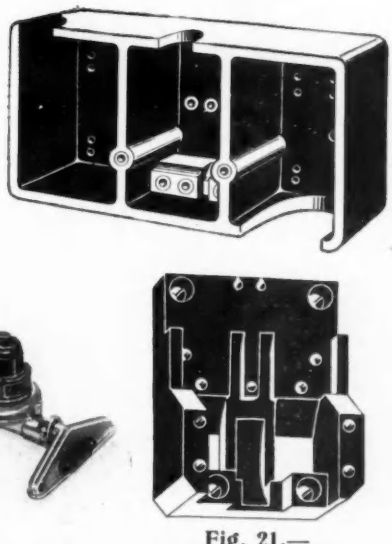


Fig. 21.—"Elo" Mouldings.

Chesterton, Jones & Co., Ltd.

This exhibit consists of a comprehensive range of domestic electric heating and cooking appliances. "David" irons are displayed in a variety of colours and a standard line in chromium-plated finish. These, in common with other of the company's appliances, are fitted with a patent connector which makes it possible for a flexible cord to be brought out either at the side or the top of the connector. A variety of electric kettles, standard and "whistling" types, are shown; these embody a safety cut-out and patent thumb-rest handle. A new appliance is the "Davidson" toaster (fig. 19). The company's ceiling bathroom heater in several designs, both in chromium and cellulose finishes, is exhibited. Other exhibits are a large variety of electric fires of the bar and "coal" type; a range of tubular heaters suitable for public buildings, &c.; thermal storage tanks in sizes ranging from 1¾ to 22 gallons, are shown in operation; and three cookers in various finishes embodying many novel features including a patent tray support for the hotplates and grill. The cooker parts are finished in vitreous enamel, and screws, nuts, &c., are protected by a special sherardising process. In addition there is a display of commercial pipe heaters, hot plates, plate warmers, &c.

Birkbys, Ltd.

The principal exhibit on this company's stand is "Elo," a synthetic resin product comprising mouldings, moulding powders, insulating varnish, and resin which is used largely for radio and electrical work, mechanical engineering, scientific instrument manufacturing, &c. This product will not soften in heat, it retains its shape and form under all normal and many abnormal conditions, is unaffected by damp, and can be moulded to very fine limits of accuracy. Metal inserts can, when required, be firmly moulded into position during the process of making, and the material can be drilled and tapped within certain very broad limits. The principal properties of "Elo," as they concern the electrical trades, are as follows:—It has a specific gravity of 1.33 to 2.0; a dielectric strength of from 30,000 to 40,000 V, a.c., for ⅛ in. thickness; it has a tensile strength of 4,000 to 5,000 lb. per sq. in.; is unaffected by temperatures up to 400 deg. F., and has no softening point. The company is also showing specimens of variegated "Elo" ware, including trays, fruit stands, finger bowls, floating bowls, and many other articles. Fig. 21 shows two examples of the company's mouldings.

British Vacuum Cleaner and Engineering Co., Ltd.

Both domestic and industrial types of vacuum cleaner are exhibited by this company, including examples of "Turbinet" and "Goblin" machines. The latest model shown is the "Goblin Wizard" which is illustrated in fig. 20. This, as will

be seen, is of the handle type, but the handle is of a special nature, about two-thirds of it being removable to enable the cleaner to be converted into a hand-type machine for cleaning furniture, &c. A patent agitator nozzle is fitted and the 200-W motor is encased in bakelite and is shockproof.

Belling & Co.

Prominent on this stand is a complete range of "Belling" electric fires, including some lately introduced models. This includes many different types of fires, both for domestic and industrial purposes. Amongst the domestic types are some portable designs in several new finishes, and several new imitation coal fires incorporating some novel features. For industrial purposes there are totally enclosed and fireproof air warmers, pipe heaters and electric hot-water radiators.

A series of electric cookers is also included in the display, ranging from the well-known "Baby Belling" cooker, suitable for small families, up to full-size models, and there are new models which have hitherto not been shown, including the one illustrated in fig. 22, designed specially to suit the hiring requirements of electricity supply undertakings.

There are also water heaters suitable for fixing into existing tanks or cylinders, or for use in conjunction with the ordinary domestic hot-water boiler. A new series of enclosed-type boiling rings makes another interesting exhibit.

Practical demonstrations are being given of the "Parmotor" relay—a new device for automatically controlling electric circuits. This has a very wide range of applications, including the thermostatic control of water heaters, electrically-heated rooms, street-lighting, &c.

Jackson Electric Stove Co., Ltd.

As in previous years, this company has a well-arranged and comprehensive display of its cookers, water heaters, wash-boilers, and fires. The fires include a number of examples of the simple sheet-metal pattern in which the spiral elements are mounted vertically in small individual reflectors. The art colours available are blue, bronze, grey, and red, and metal finishes are also provided. The company's storage water heaters are made in a wide range of sizes and loadings, rising from 6½ gal. (500 W) to 33 gal. (2,000 W). The "Quick-service" sink-type has been designed for the instant supply of small quantities of hot water. The selection of electric cookers shown includes models for small and large families, for canteens, and for hotels. One of the larger cookers which is on view is illustrated in fig. 23. It is the "24D" model which comprises two of the company's standard "No. 24" ovens, each of which has a cooking space measuring 19 in. by 16 in. by 16 in. These are surmounted by a cast hob containing five hotplates (two 1.5-kW, two 2.25-kW, and one 3.0-kW) and a 13 in. by 10 in. grill with a loading of 2.5 kW. The hot cupboards which surmount the whole each have 350-W elements. The total loading of the range is 19.1 kW.

Fig. 22.—A "Belling" Cooker for Hiring Schemes.

Fig. 23.—The Jackson "No. 24D" Cooker.

Fig. 24.—The "Keepalite" Automatic Control Panel.

B.K.B. Electric Motors, Ltd.

A range of small-power electric motors is shown by this company, ranging from a little home "cine motor" to an industrial type of approximately 12½ h.p. In addition to a three-phase induction motor the company is now marketing a single-phase repulsion-start induction pattern in a number of ratings up to 1½ h.p. This type has a high starting torque feature and a brush-lifting device. Split-phase motors for single-phase circuits are also shown, together with fractional h.p. slip-ring motors. Another item of interest is a range of universal motors up to ¼ h.p. The alternating current exhibits draw energy from a rotary alternator of the company's manufacture.

Hoover, Ltd.

The latest types of "Hoover" vacuum cleaners shown on this stand have many advantages over previous models. The new "Model 725" is claimed to be far more rapid in operation and to be 25 per cent. more efficient than any previous design.

India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.

At this stand is displayed a large range of ebonite goods, including pumps, pipes, taps, bends, sheet, rod, metal tanks lined and covered with ebonite, and many other articles of interest to the electrical industry. A selection of rubber hose, tubing, valves, cord, and moulded goods will be on view, as well as rubber gloves, gauntlets, and mittens for electrical and chemical purposes, rubber and canvas driving and conveyor belting, and gutta-percha articles such as jugs, carboys, bottles, &c. In addition there is shown a selection of primary batteries and telegraph and testing instruments. The whole of the floor space of the stand is covered with "Silvertown" rubber tiling.

Chloride Electrical Storage Co., Ltd.

Storage batteries for a great variety of electrical purposes are exhibited on this stand. These include batteries for stationary installations such as country-house lighting plants, central power stations, marine work, emergency lighting in theatres, kinemas, &c. "Exide" batteries for high-tension and low-tension wireless purposes, talking-film installations and sound projector systems are also shown, including a comprehensive range of unspillable cells and "Gel-Cel" batteries containing jelly electrolyte. Cells for miners' handlamps, "Drydex" dry batteries in a variety of sizes for h.t. wireless purposes and for pocket lamps, electric torches, bells, &c., are exhibited, together with Exide Ironclad batteries for marine work and "Lux" batteries for lighting railway trains. The "Keepalite" system of automatic emergency lighting for hospitals, kinemas, &c., is shown in operation. This system employs an automatic control switch, fig. 24, that, in the event of any interruption to the ordinary electricity supply, instantly switches on current from a Chloride battery to supply emergency lights at essential points.

British Electrical Development Association.

This Association again occupies the octagonal kiosk in the centre of the electrical section. Modifications have been made to the structure and the lighting and decoration has been entirely re-designed. Visitors can obtain full and up-to-date information concerning electrical facilities available in any part of the kingdom. A staff is in attendance to deal with such inquiries, and to render every possible assistance to electrical visitors, while a "Guide to the Electrical Section" has been prepared.

British Dardelet Threadlock, Ltd.

"Dardelet" self-locking screw-thread bolts and nuts are shown in black hot forged, black cold-headed and bright steel. There is also a collection of railway fishbolts, crossing bolts, conveyor and tub bolts, Atkins's socket screws, &c. In the company's invention there is a conical or inclined surface at the root of the bolt thread, while the nut thread is only about half as wide as the groove in the nut. This arrangement gives the nut latitude to slide along the bolt when force is exerted upon its underside. In this way the nut thread is wedged tightly on the cone at the bottom of the bolt thread giving a secure locking action.

Electrical Exports of Germany.

A Comparison of the 1929 and 1930 Figures.

THE following statistics showing the value (in thousands of Reichsmarks), weight in double centner (equals 220 lb.), and in some instances the number of pieces, of electrical apparatus exported from Germany in 1930 are based on the official foreign trade returns of that country. The figures for 1929 are added for purposes of comparison, and notes of increases and decreases are made. For both years the totals include exports on reparation account.

The returns subdivide the group covering dynamos, motors, convertors, and transformers into six classes according to weight, and give the principal destinations of each class. In 1930, Great Britain, Holland, Belgium, and France figured prominently among those up to 150 kg. in weight; Russia, Holland, and Argentina were good customers, as well as Belgium, for those from 150 kg. to 3,000 kg., whilst of those over 3,000 kg., France, Russia, Austria, Holland, Spain, Argentina, Mexico, and Japan were noteworthy buyers.

	1929.	1930.	Inc. or dec.
Electric lighting and starting apparatus for motor vehicles—			
Value	6,970	5,580	— 1,390
(Double centner)	7,980	7,040	— 940
Number	87,000	77,000	—10,000
[Notably to Italy, Czecho-Slovakia, and U.S.A.]			
Dynamos, motors, convertors, and transformers up to 5 double-centner—			
Value	41,480	37,350	— 4,130
Number	739,920	774,880	+34,960
(Double centner)	118,930	97,600	—21,330
Ditto, from 5 to 30 d.-centner—			
Value	17,410	20,690	+ 3,280
Number	7,510	7,940	+ 430
(Double centner)	76,150	82,710	+ 6,560
Ditto, over 30 d.-centner—			
Value	22,980	33,810	+10,830
Number	1,160	1,560	+ 400
(Double centner)	132,860	170,560	+37,700
Armatures and commutators—			
Value	8,900	10,170	+ 1,270
(Double centner)	20,700	24,850	+ 4,150
Accumulators, plates, &c.—			
Value	6,490	5,780	— 710
(Double centner)	41,740	36,600	— 5,140
To Denmark ,,	5,660	4,870	— 790
,, Finland ,,	1,800	1,690	— 110
,, Holland ,,	9,620	10,550	+ 930
,, France ,,	6,330	2,850	— 3,480
,, Argentina ,,	2,170	2,930	+ 760
Electric cable—			
Value	59,250	55,370	— 3,880
(Double centner)	555,960	545,070	—10,890
To Denmark ,,	10,230	5,350	— 4,880
,, Holland ,,	143,170	165,530	+22,360
,, Gt. Britain ,,	19,860	21,930	+ 2,070
,, Dutch East Indies,,	25,680	25,590	— 90
,, Norway ,,	9,300	9,320	+ 20
,, Sweden ,,	21,740	21,500	— 240
,, Uruguay ,,	8,650	13,270	+ 4,620
,, Argentina ,,	66,450	56,430	—10,020
,, Japan ,,	19,038	5,670	—13,360
,, Finland ,,	16,960	12,710	— 4,250
,, France ,,	60,530	24,210	—36,320
,, Irish Free State ,,	12,490	12,360	— 130
Measuring and recording instruments—			
Value	43,900	39,720	— 4,180
(Double centner)	33,700	28,880	— 4,820
To Gt. Britain ,,	2,290	2,060	— 230
,, Italy ,,	3,040	2,040	— 1,000
,, Holland ,,	3,490	3,680	+ 190
,, Russia ,,	2,510	2,600	+ 90
,, Sweden ,,	1,950	1,940	— 10
,, Spain ,,	1,790	1,250	— 540
,, Czecho-Slovakia ,,	1,250	1,110	— 140
,, Argentina ,,	1,940	1,690	— 250
Electric irons—			
Value	1,840	1,860	+ 20
Electric heating and cooking apparatus—			
Value	10,510	11,070	+ 560
Metal-filament lamps—			
Value	37,490	34,900	— 2,590
(Double centner)	13,600	12,930	— 670
(Hundreds)	808,100	818,300	+10,200
To Denmark (Double centner)	40,190	40,230	+ 40
,, Finland ,,	15,690	14,320	— 1,370
,, France ,,	41,940	96,630	+54,690
,, Gt. Britain ,,	74,540	87,200	+12,660
,, Italy ,,	69,170	69,840	+ 670
,, Norway ,,	18,310	18,780	+ 470
,, Mexico ,,	1,080	1,620	+ 540
,, Sweden ,,	49,490	50,220	+ 730
,, Switzerland ,,	20,730	20,910	+ 180
,, Czecho-Slovakia ,,	48,590	38,500	—10,090
,, China ,,	27,410	54,310	+26,900
,, Argentina ,,	44,020	28,700	—15,320
,, Brazil ,,	25,760	12,290	—13,470
Telephone material—			
Value	38,150	35,770	— 2,380
(Double centner)	20,090	24,450	+ 4,360
To Holland ,,	2,290	3,570	+ 1,280
,, Switzerland ,,	730	870	+ 140
,, Japan ,,	610	1,010	+ 400
,, Italy ,,	3,790	6,170	+ 2,380
Wireless Material—			
Value	68,890	78,200	+ 9,310
(Double centner)	60,660	74,770	+14,110
To Denmark ,,	3,820	4,200	+ 380
,, Gt. Britain ,,	13,490	20,300	+ 6,810
,, Holland ,,	11,120	9,670	— 1,450
,, Sweden ,,	2,820	4,560	+ 1,740
,, Australia ,,	1,950	920	— 1,030
,, Argentina ,,	2,070	1,270	— 800
Ignition apparatus, other than magnetos, and accessories for motor vehicles—			
Value	26,550	23,040	— 3,510
(Double centner)	26,410	23,520	— 2,890
To Gt. Britain ,,	1,370	1,850	+ 480
,, Italy ,,	1,900	1,730	— 170
,, Holland ,,	920	1,120	+ 200
,, Czecho-Slovakia ,,	1,740	1,300	— 440
,, United States ,,	9,040	3,660	— 5,380
,, Sweden ,,	980	1,880	+ 900
Electric safety and signalling apparatus—			
Value	10,240	9,950	— 290
(Double centner)	14,260	12,870	— 1,390
To Denmark ,,	740	1,340	+ 600
,, Gt. Britain ,,	3,430	3,210	— 220
,, Italy ,,	525	660	+ 135
,, Holland ,,	1,560	1,380	— 180
Electrical apparatus for lighting, power transmission, electrolysis, resistances, &c.—			
Value	124,990	122,160	— 2,830
(Double centner)	330,210	309,580	—20,630
To Finland ,,	7,910	6,400	— 1,510
,, Gt. Britain ,,	19,040	7,890	—11,150
,, Holland ,,	40,440	13,450	—26,990
,, Austria ,,	17,230	8,850	— 8,380
,, Russia ,,	15,130	21,160	+ 6,030
,, Sweden ,,	16,770	19,060	+ 2,290
,, Dutch East Indies ,,	14,300	8,410	— 5,890
,, Argentina ,,	15,690	11,050	— 4,640
Galvanic batteries and parts and heating elements—			
Value	14,800	13,540	— 1,260
(Double centner)	80,640	72,300	— 8,340
To Great Britain ,,	45,160	39,490	— 5,670
,, Holland ,,	2,960	2,760	— 200
,, Sweden ,,	7,100	7,270	+ 170
Telegraph or telephone insulators—			
Value	8,420	6,650	— 1,770
(Double centner)	85,240	69,310	—15,930
To Switzerland ,,	5,950	10,570	+ 4,620
,, India ,,	2,820	970	— 1,850
,, Dutch East Indies ,,	5,130	5,080	— 50
,, Irish Free State ,,	3,370	1,090	— 2,280
,, Argentina ,,	5,900	4,600	— 1,300

	1929.	1930.	Inc. or dec.
Electro-medical and dental apparatus—			
Value	21,690	19,810	– 1,880
Insulating material of asbestos, mica, and micanite—			
Value	840	725	– 115
(Double centner)	650	655	+ 5
Carbon brushes, microphone carbons, &c.—			
Value	1,860	2,080	+ 220
(Double centner)	880	920	+ 40
Arc lamp carbons—			
Value	2,820	2,610	– 210
(Double centner)	7,880	7,480	– 400
Electrodes—			
Value	10,180	10,670	+ 490
(Double centner)	270,390	240,470	–29,920

The total exports, machinery and apparatus, including reparation deliveries, are compared below :—

	1929.		1930.	
	100 kg.	Marks 000.	100 kg.	Marks 000.
Electrical machinery and parts	356,616	97,751	382,750	107,608
Electrotechnical products	1,280,460	481,480	1,235,210	465,810

The values of such supplies in 1929 and 1930, respectively, were : machinery and parts, 6,684,000 m. and 16,339,000 m.; electrotechnical products, 26,383,000 m. and 19,079,000 m.

Total imports of both machinery and apparatus fell considerably in 1930, as compared with 1929, as will be seen from the following statement :—

IMPORTS.

	100 kg.	Marks 000.	100 kg.	Marks 000.
Electrical machinery and parts	41.764	11,599	30,277	9,200
Electrotechnical products ...	53,196	39,278	38,790	34,436

The Heating of Buildings.*

General Considerations Governing the Use of Electricity for the Purpose.

By D. J. BOLTON.

IT is well, in the first place, to realise that the heating of buildings is only a means to an end, the heating of human beings—or, more precisely, giving them the impression of warmth. We who have to endure the alternate rigour and mugginess of an English winter are occasionally tantalised by pictures of Swiss tourists enjoying an outdoor luncheon whilst all around are snow and ice. The radiant energy from the mid-day sun combined with the fresh air and exhilarating surroundings make it possible to sit at ease with the thermometer below zero. Such pictures are useful reminders that we have not yet invented an instrument to measure human comfort, and we must not mistake any of our terrestrial instruments, marvellous though they are, for this celestial measuring device. Such remarks may seem more relevant to questions of house warming than to the heating of buildings and offices, in which air temperature must inevitably be the principal criterion; but even here it must not be forgotten that the ultimate test is psychological rather than thermometric.

Life is commonly regarded as being made up of two parts, work and play, and building heating may usefully be divided up in a similar manner, namely, heating for work and heating for play. In the former case purely utilitarian considerations are the determining, if not the only, factor. In the latter case other factors come in, and in particular it may be said that domestic heating should usually include an appeal to the eye as well as to the feeling of warmth. A visible red-hot source undoubtedly gives more personal satisfaction, and the makers of imitation coal fires have shown great ingenuity in exploring the potentialities of the electric glow. There is even the possibility of roping in some of the other senses. In the coal fire we have not only heat as well as light, but sound also—the crackling yule log, the hissing spurts of escaping coal gas. This suggests other characteristics to imitate, and some day we may, perhaps, have an electric fire with noises! This, however, is by the way; the present purpose is to study only the first group, heating for work, *i.e.*, the warming of offices, works, and large buildings generally. For this is required heat pure and simple, and nobody seems to have suggested that we might paint our radiators vermillion and illuminate them by red glow lamps, or even decorate their tops with imitation coal knobs.

The process of artificial heating may be regarded as a chain of events, stretching from the coal in the mine or pithead at one end, to room warmth at the other. There is a number of possible chains, and these must obviously be compared as wholes and not in parts. It is useless to compare an electric fire with a coal fire or gas production with electric generation; one must take the complete process from start to finish in every case. The following are some of the possible chains :—

Coal ... ... Open grate fire
Coal —Coke—boiler ... ... Water radiator
Coal —Coal gas —boiler ... ... Water radiator
Coal —Coal gas ... ... Gas fire
Coal—mechanical work—electrical energy —boiler Water radiator
Coal—mechanical work—electrical energy — Elec ric fire
Oil—boiler ... ... Water radia or

Fuel Costs of Alternative Systems.

It was stated above that the comparison must be made between complete chains of events stretching from coal to room heat. But even this is insufficiently complete because it deals with quantities of fuel instead of values. The starting point must not be the lb. in the scuttle, but the £ in the pocket. A delightfully simple way of treating the problem (and, incidentally, of ruling out any hope for electric heating) is to say that 1 lb. of coal with a calorific value of 12,000 B.th.u., if burnt in an open fire with an efficiency of 25 per cent., will give 3,000 B.th.u., whereas the same pound of coal consumed in making electricity at present-day efficiencies of generation and transmission generally gives something under 2,000 B.th.u. in the room, quite apart from the cost of the plant required to convert it. But leaving aside all qualitative differences, this neglects the vital fact that the coal costs the householder some 45s. a ton, whilst the supply station pays 15s. a ton for fuel of only slightly smaller heating value.

In the following table an attempt is made to compare fuel costs alone of a number of different heating systems. In most of the cases the chain of events is taken right from the fuel to the heated room, but in the last four the starting point is a public supply system. The prices represent those ruling in 1928-29, the last period for which it is possible to get definite figures throughout. The final column gives the total heat

ANALYSIS OF FUEL COST

System.	Particulars of fuel. Kind.	Price. Per ton.	Calorific value. B.th.u. per lb.	Cost. B.th.u. per £1 (millions).	Efficiencies.	Utilisation. B.th.u. in room per £1 (millions).
Domestic grate	High grade coal	48/-	14,000	13.1	25%	3.3
Coke-fired boiler	Gas coke	28/-	12,000	19.2	55% × 85%	10 0
Oil fired boiler...	Fue oil	65/-	18,500	12.8	70% × 9 %	8.5
Gas-fired boiler	Gas coal giving 12,000 cb. ft. at net cost of 12/-		500 per cb. ft.	10.0	70% × 95%	6 6
Electrode boiler	Low grade coal	15/7	11,000	31.6	18% × 95% × 90%	4.9
Gas-fire boiler off mains at 5d. per therm					70% × 95%	3.2
Electr de boiler off mains at ½d. per kWh.					90%	3.0
Gas fire off mains at 8½d. p r therm					10 0%	1.1
Electric radiator off mains at ¾d. per kWh					55%	1.5

* A short course of lectures now being given at the Regent Street Polytechnic on the above subject has special reference to the thermal storage system installed in the new extension, Great Portland Street. The first lecture dealing with general principles is summarised in this article.

which finds its way into the room from £1 expenditure upon fuel. It must be remembered, however, that not all this heat has the same value, since radiation is in general more effective than convection. In the cases of the coal fire and the gas fire, all the heat shown is radiation (since the convection is wasted), but in the other cases the convection heat is included in the figure.

Comparative Efficiencies.

With regard to the efficiencies with which to credit the different systems, great difficulty was found in arriving at a fair estimate. Works tests differ from running performances much more in the case of fuel plant than with purely electrical gear, and naturally the makers of the plant are inclined to be optimistic when reviewing their own gear and correspondingly pessimistic when comparisons with competing plant are being made. However, it may be stated without question that as regards the fuel-fired boiler (coke, oil, or gas) the efficiency cannot rise much above 80 per cent., or there will be insufficient temperature in the smoke stack to ensure adequate draught. On full load and with perfect adjustment of the burner, &c., the oil- or gas-fired boiler may therefore achieve a test efficiency of 75-80 per cent., and in crediting them with a working efficiency of 70 per cent. under average conditions the allowance is probably on the generous side.

With the coke-fired boiler correctly stoked and with a steady cycle of load, an efficiency of 70 per cent. should also be realisable. But the effective all-day efficiency is likely to be very considerably less than this, owing to the fact that on many days and at many times in the day the heating required will fall below the normal; and on such occasions the non-automatic nature of the stoking makes the system far less responsive to changes in requirement, and therefore far less able to utilise day-to-day economies in firing. This discrepancy is not strictly a reduction in efficiency of the boiler itself, but rather a failure in economy of the system as a whole. In comparing boilers, however, it was thought best to include the difference at this point rather than at any other. An overall efficiency of 55 per cent. is therefore estimated, and it may be stated in passing that the ratio of these two efficiencies, namely, about 1¼ to 1, was borne out by our experience at the Regent Street building when a change-over was made from coke to oil firing.

In each of the fuel-fired systems an additional 5 per cent. of losses are assumed in the water distribution system, and in the case of the electrical plant a figure of 10 per cent. is taken so as to cover the additional losses in the boiler and storage cylinders. As regards the electricity supply, a thermal efficiency of 18 per cent. is assumed on the station with 5 per cent. transmission losses (it will be realised that the supply is at high voltage).

Referring to the table again, two lines are devoted to central-heating systems supplied from public mains, with gas at 5d. per therm and electricity at ½d. per kWh, respectively. These may be regarded as the lowest likely figures for large-scale supply, full allowance being made in the second case for the off-peak character of the load. The last two lines of the table refer to domestic heating, using gas and electric radiators respectively, the tariffs being those paid by the present writer in his own house.

It will be seen that the table aims at a generalised view of a large number of systems, and refers to the fuel cost only. It now remains to make somewhat more detailed comparisons. For this purpose only two systems will be considered—the coke-fired boiler and the electrode boiler—these being the likeliest competitors in the field at present under survey. Costs are first compared, and then other factors which are less directly economic in character. The costs themselves can be considered under two heads, capital and operating.

Capital Expenditure.

As regards first costs, figures have been obtained from one or two sources, including an example given in a recent Institution paper* and from our own experience with the two Polytechnic installations. The conclusion from these few cases appears to be that the first cost of the electrical installation is from 1.4 to 1.9 times as great as that of a coke-fired boiler plant, including in the latter the cost of flues, &c. (A middle figure of 1.6 is assumed below.) The ratio, however, goes down with increase in size of plant. For a change-over, or where the saving in flues is not realisable, the balance would, of course, be less favourable to the electric system. Against this can be put the life of the electric boiler as not less than twice that of the other, say 25 to 30 years as against 12. Taking interest at 5½ per cent. and half-yearly sinking funds of appropriate lengths, the comparison comes out as follows:—

Assumption.	Interest.	Depr.	Total charges.
Coke boiler costing 100 units and lasting 12 years	5.5%	6.0%	11.5
Electric boiler costing 160 units and lasting 25 years	5.5%	1.9%	7.4×1.6 =11.8

Thus, even at the lowest estimate for the life of the electric plant, the total capital charges are very little greater than those of the coke boiler.

Closely connected with installation costs is the question of floor or room space occupied. In the case of our own installation the building was originally planned for coke firing and when we decided to install the other it was found possible to put the storage cylinders and the base of the boiler below the originally intended floor level. Although this experience may be peculiar, a considerable space saving can usually be anticipated from the electrical installation. It is difficult to assess the annual value of such a result, but in a building in the heart of London every cubic inch has an appreciable annual value and a system which releases useful floor space is correspondingly economical.

Costs of Operation.

Under the heading of operation costs there are two main items, labour and fuel (or electricity). As regards labour our own experience, even with oil firing, is that constant attendance is advisable, resulting in a labour charge of the same order of magnitude as the fuel cost. With coke firing this would undoubtedly be greater. In the electrical case constant supervision is unnecessary—the building electricians can give whatever attention is required and when classes close down the electricians can go home, leaving the installation (though on full load) to look after itself.

The last item, the fuel or supply cost, is of course the crux of the problem. If electricity could be obtained for anywhere near the fuel cost represented on the fifth line of the table, the extra cost on this account would unquestionably be more than balanced by the reduction in labour and other charges. But electricity cannot be bought for its fuel cost because the machinery has to be paid for also, and it is here that thermal storage comes in. The feasability of electrical heating on a large scale depends almost entirely on the extent to which the supply authority is willing to whittle down the heating consumers' share of the capital expenses of supply. Using round figures the whole situation as it emerges from the figures given in the table can be put in a nutshell as follows:—

Present fuel cost in this country (approx.) 0.14d. per kWh.

Electric heating will generally be cheaper with energy at 0.20d. or under.

Electric heating will generally be dearer with energy at 0.30d. or over.

Indirect Advantages of Electric Heating.

A few other points should be mentioned. The efficiencies and other figures given are supposed to represent first-class modern plant properly attended and *as first installed*. The lapse of time, accumulations of scale and soot, and imperfections of stoking will inevitably reduce these efficiencies in all cases except that of the electric plant. The latter is not only automatic and stoker-proof, but furthermore is likely to maintain its annual efficiency practically unimpaired throughout its life. In fact, in all the comparative figures employed, studious care has been taken to make no claims for electrical operation that cannot be amply justified, and, on the other hand, where doubt exists (as with the non-electrical gear) benefit of the doubt has always been given. In all factors such as cleanliness, safety and ease of control, the electric system scores heavily. Finally there is the civic aspect, and in a town in which traffic congestion is a first-class evil, and fogs are not unknown, a system that brings no wagons through the streets and puts no fumes into the air is playing the true citizen's part.

Thermo-dynamic Principles.

In conclusion, a word or two on first principles. When mechanical work or electrical energy is converted into heat energy the work becomes extinguished entirely. That is to say, it all becomes heat and an efficiency of 100 per cent. is possible. But when heat is converted to work this can only be done through the agency of an engine and the heat is not extinguished entirely, but most of it is merely de-graded from a higher to a lower temperature. Moreover if T_1 and T_2 are these temperatures (absolute) the utmost ratio that can be converted into work, *i.e.*, the highest possible efficiency is $T_1 - T_2/T_1$. Thus a steam engine using present day values may have a maximum possible thermal efficiency of 40 per cent., which it cannot exceed, even if there are no engine losses whatsoever. This iron law of thermodynamics seems inescapable, and so far no Einstein has appeared to release us from its tyranny. There is, however, one way of "getting our own back" and that is by converting the electrical energy not into heat but into mechanical work. This work can then be used in a reversed heat engine to up-grade heat and move it from one place to another. The possibilities of this attractive looking scheme were discussed in a recent I.E.E. paper† in which it was shown that when a really low-grade heat is required (*i.e.*, for a small temperature range, as in the heating of swimming baths) efficiencies of several hundred per cent. can be obtained. The heat thus made available is not of course created by the electrical energy, it is merely moved from one place or temperature to another. Just as a refrigerator pumps heat from the cold chamber to some convenient place where it can be dissipated, so the reversed heat engine will take heat from some convenient place (such as a surrounding atmosphere or water supply) and discharge it to the inside of the building at a higher temperature. In fact, the time may come when our buildings achieve the ideal "winter sports" climate mentioned at the beginning of the article: heat pumped into the building from the outside will give us the comfort of warmth whilst it induces frost all around!

* Monkhouse and Grant, *Journal* I.E.E., Vol. 68, No. 402, June, 1930.

† T. G. N. Haldane, *Journal I.E.E.*, Vol. 68, No. 402, June, 1930.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

Skirt for S.C. Lampholders.

The cap of a s.c. lamp, forming as it does one of the contacts, is electrically alive, either when the current is switched on or when the switch, although "off" is on the wrong pole. An electrician relamping in such a case would be liable to a shock, and as a consequence the installation of skirted or protected lampholders has now become compulsory under H.O. Regulations, and active steps are being taken to enforce the observance of the Regulation. As a result BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17, have devised the porcelain attachable skirt shown in fig. 1. The skirt itself is of porcelain, and it is supplied with a brass collar which holds the skirt in claws, at the same time gripping securely round the neck of the existing holder through the medium of a cork liner. Since this complete attachment can be slipped over existing lampholders, on which it takes a firm grip, it will be apparent that the necessary protection can be secured without in any way dismantling or re-wiring existing fittings. Generally speaking all fittings equipped with E.s. lamps can be brought into line with Home Office requirements by the use of this skirt; patents have been applied for.

Fig. 1.—"Benjamin" S.C. Lampholder Skirt.

A Novel Cable.

An interesting cable which has been supplied by Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1, in connection with the "Tote" installations at Hamilton Park, Ayr, Redcar, and Nottingham racecourses is illustrated in fig. 2. The cable contains 954 plain copper conductors, each lapped with two coats of specially selected paper, the cores then being laid up singly, lapped with four coats of specially selected paper, impregnated, and sheathed with pure lead. The approximate overall diameter of the cable is 3 in. At the Hamilton Park installation nine lengths of 226 yards of this cable were drawn into steel pipes, and at Ayr seven lengths of 271 yards were treated similarly. In each case the intricate work was accomplished without causing any faults on the cable The cable is used from the ticket-issuing windows, 10 cores being required for each ticket machine,

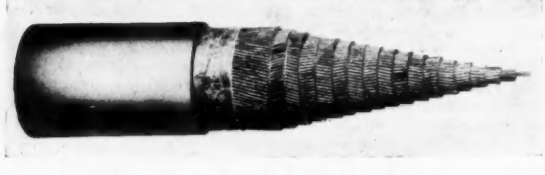


Fig. 2.—A Tote Cable; 954 Cores.

1-9-0. The cable is terminated to silk- and cotton-covered cables, and is connected to 100-way blocks and tags similar to those used in G.P.O. telephone exchanges. From these blocks connections are made by Messrs. Ericssons to their apparatus.

Water-heater Jackets.

The success of any electric water-heating scheme depends on the efficient lagging or heat insulation of the cylinder, pipes, &c., and in this connection the "Eeto" cylinder jackets marketed by Messrs. P. HIGSON & Co., 24, River Street, Bolton, are of particular interest. These jackets are constructed of a special material made up of asbestos and magnesia, two proved heat-insulators of high quality. A jacket is built up of a number of strips of the material, which are strung or hooked together at the top ends and laid uniformly round the wall of the tank, so as to cover it completely. The set of strips are bound round the tank tightly by black steel bands provided with the jacket. The strips are made in 6-in. and 3-in. widths, 1 in. and $\frac{3}{4}$ in. thick. The jackets can be made to fit any type of cylindrical or rectangular storage tank, and it is claimed that a jacket can be fixed easily in, say, ten minutes. The material is vermin proof and very durable.

Illumination Strip.

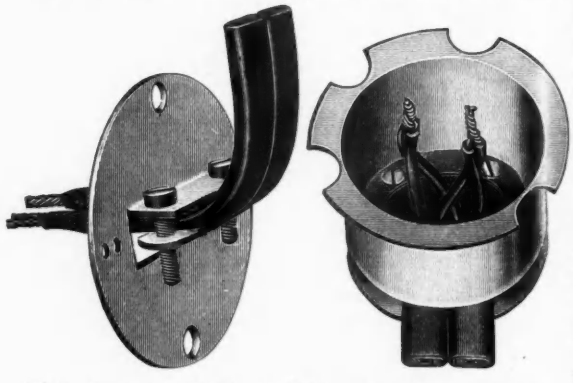
We have received from the NORTHERN STEEL & HARDWARE CO., LTD., 1 and 3, Southgate, Deansgate, Manchester, samples of the new "Nosco" strip-lighting systems. One employs E.s. and the other s.E.s. porcelain lampholders, and each lampholder is supplied with both a batten-type clip and a suspension clip, so that the strip may be screwed down or suspended as desired. Each system employs rubber-sheathed cable on the "straight-through" principle, and the holders are sealed with compound at the connection sides, while a rubber washer at the junction of each lamp and the holder results in a waterproof joint. The larger strip is supplied with the lighting points at 12-, 18- and 24-in. centres, while the smaller strip is arranged with the points 8, 10 and 12 in. apart. Clear- or natural-colour-glass lamps are supplied.

A Special Cutting Vice.

The WREN TOOL CO., 174, Sixth Avenue, Manor Park, E.12. is marketing the "Any-square cut," an appliance by means of which metal rods, bars, tubes, and so on, can be cut accurately at given angles. The vice may be held by a projecting lug between the jaws of any ordinary bench vice, or clamped on any long length of rod, bar or tube, &c. A true square or angle cut can be effected to within 0.002 in. The guides can be adjusted to accommodate varying thicknesses of saw blades. In operation the material to be cut is held between two jaws at the required angle to the saw guides.

Bonding Accessories for L.C. Wiring.

In connection with their "Tenby" l.c. wiring system, Messrs. S. O. BOWKER, LTD., 20, Branston Street, Birmingham, have recently introduced a bonding plate and cup, figs 3 and 4, respectively. These accessories are designed to overcome the objections to bringing the metallic protection of cables through to the surface of the wall or ceiling. In both cases the v.i.r. cable leads are kept free from contact with lime and plaster. In the case of the plate the cable sheathing is brought through to the surface of the wall or ceiling and maintained in that position, the bonding being effected by a bar clamp. The plate fits the recess of a standard wood block, and provides for the earthing of accessories.



Figs. 3 and 4.—"Tenby" Bonding Plate and Cup.

The bonding in the cup is provided by a ring at the bottom, by means of which the cables are also held in a fixed position. The cup is designed to accommodate any standard 5-A, 2-pin or 2-A, 3-pin wall socket; for a 2-A, 2-pin socket an adapting ring is made. The flange slots provide for either two- or three-hole fixing. The socket flange is, of course, adequately earthed by ordinary fixing. A $1\frac{3}{4}$-in. hole in a skirting board is all that is required to assure the necessary accommodation for the cup.

Metal-clad Protection.

General observations on its application to domestic apparatus and the construction of mining and power switchgear.

(Extracts from a paper read before the INSTITUTION OF ENGINEERING INSPECTION.)

THE metal-clad principle of protecting large and small electrical switchgear was the subject of a paper read recently in London by **Mr. J. R. Cowie** (of Messrs. A. Reyrolle & Co., Ltd.).

The first part of the paper was devoted to the consideration of safety precautions in connection with domestic appliances, primarily in the bathroom, kitchen, in close proximity to any central-heating outfits, and electric radiators. Whilst the bath itself was usually well earthed by means of its water pipe, not enough attention was paid to the waste pipe, which ought to be definitely electrically connected to the water pipe, for a waste pipe could be insulated by means of its jointing washers. Further, he recommended that all points, including switch covers and radiator cases, ought to be earthed, or should be made of insulating material. In a bathroom, too, radiator elements should have a protecting metal screen. It was possible to protect adequately throughout a house by running a definite earth wire to every room, or, alternatively, if screwed steel tubing were used, the conduit itself could be used for the earth return, precautions being taken to ensure that there was no possible chance of the electrical tubing coming into contact with any other metal in the building; it should be definitely bonded and sweated to the main cold-water pipe.

With regard to cookers, he advocated continuous earthing throughout, and the same precautions should be taken with electric washing and ironing machines. He added that the application of protected metal inlets had been made so as to obviate the necessity of both a control switch and a plug and socket, although the dividing point at which that was permissible was still under consideration by the Wiring Regulations Committee of the Institution of Electrical Engineers.

Mr. Cowie then discussed the construction of factory distribution gear and endorsed the statement made by Mr. C. C. Paterson (president of the I.E.E.) in his presidential address that very many of the old-established pieces of apparatus in the industry would well repay further experiment and research in the light of changed service conditions, greater knowledge, and wider range of materials available; he added that in no line of industry could these remarks be applied more aptly than in insulation problems and switchgear generally.

Mining switchgear was a class of apparatus with problems of its own; in general the flange type of apparatus was the standard. Experiments carried out by the British Electrical and Allied Industries Research Association in conjunction with the Safety in Mines Department had shown that with a 9 per cent. mixture of methane and air a minimum flange width of 1 in. and 0.01 gap were safe, and that the maximum internal pressure to be withstood during an explosion was in the region of 110 lb. In practice one had to allow for more than that. The width of flange should bear some relation to the cubic capacity of the container, and no matter how the tank might breathe whilst the explosion was taking place the gap must never exceed 0.01 in.

Consideration was being given to the synchronisation of the maximum rupturing-capacity test with an explosive test. Mr. Cowie did not think such a test was fair, however, as an adequately designed switch did not fail within its rupturing duty, and only switch failure could synchronise the two incidents. Another aspect of the case was that the actual explosion of decomposed gases of the switch oil might be more severe than a methane-air mixture explosion. Trapped oil gas, after the clearance of a fault, might be ignited by a failure of insulation; that was a factor which might have to be considered very seriously.

With regard to high-voltage distribution gear, the metal-clad switchgear of the horizontal draw-out type was easier to examine and put back into service than the vertical drop-down type. Anything that was awkward or uncomfortable for a man to do ultimately became a neglected factor. The tendency of modern design in certain of the larger forms of switchgear might, however, make it expedient to use the drop-down vertical type, and Mr. Gregory (of Messrs. Merz & McLellan), addressing the World Power Conference, gave the dividing line at or about a rupturing capacity of 700,000 kVA. The advantage of this type of gear became more a question of voltage than of rupturing capacity, because at the higher voltages it would be simpler to provide two oil switches per circuit, the switches themselves forming their own isolators, than to try to provide switches, plus selector, and isolating features.

Discussion.

Mr. J. T. Mould agreed entirely that it was far safer to earth domestic appliances than merely to insulate them, because it was so difficult to ensure not only that everything that should be insulated was effectively insulated in the first place, but also that it remained effectively insulated. With regard to flameproof gear his company had adopted the practice of providing, by means of corrugations, a long tortuous path through which the gases must escape, so that there was no need to depend upon forcing flanges apart, or upon an opening the exact dimensions of which one did not know. He did not suggest that the wide-flange method was not equally successful, but it appeared to be somewhat more expensive.

Mr. W. N. Y. King, speaking from the point of view of the inspecting engineer, emphasised that breaking capacity was the main point; a switch must break, say, 1,500,000 kVA and yet remain fit to be put into circuit again without undergoing repair, although, of course, it would not be in the same condition after the break as it was before. The latest type of tank was as nearly as possible a sphere. It was important to ensure that the auxiliary wiring was carefully protected, so that there would be no chance of the switch failing owing to the auxiliary wiring being damaged. The facility with which large breakers could be taken out for examination and replaced could be improved by using an electric motor and oil pump mounted on a truck as a hydraulic ram to push the breaker and the heavy tank into position.

Mr. S. J. Hawkins remarked that he had asked a number of switchgear makers for their opinions as to what the capacity of tanks should be, but had found that no two makers agreed. One maker had said that with spring suspension less oil could be used, but another maker had disagreed with that view.

Mr. C. H. Pike (of the Underground Railways) said that his undertaking generally adopted the cubicle type, which was found to be more suitable than the metal-clad type. He had not much knowledge of the economics of the problem, but he imagined that the cost of the cubicle type was much lower than that of the metal-clad type for 11,000 volts. Further, from the point of view of testing, he suggested that when metal-clad apparatus was used the current transformers were very inaccessible, and he urged that more attention should be given to the problem of ensuring accessibility for testing purposes.

Mr. R. P. Wilson pointed out that if an oil switch had thrown its oil it ceased to be an oil switch. The recommendation that domestic screwed steel tubing should be used as an earth return, definitely bonded and sweated to the main cold-water pipe, might be easy to adopt in an ordinary private house, but it was not always easy in a flat. He had found that in his own flat the main cold-water pipe was absolutely insulated from earth, and he ventured to suggest that probably in the majority of flats that pipe was not a good conductor to earth, except when water was flowing through it.

Mr. H. F. Knell said that his undertaking had recently scrapped all its brick-built cubicle gear, one very important reason being that it was considered entirely inadequate in view of capacity due to the proximity of the grid. That was a very strong argument in favour of iron-clad gear. He regarded it as essential that large switchgear, for voltages down to even 11,000, should be fool-proof, for he had known very able men to make mistakes at times. He expressed his confidence in the 11,000-volt outdoor type of switchgear installed by his undertaking, both from the points of view of economy and of general efficiency; it was satisfactory also from the point of view of the space it occupied, and it was unnecessary to erect expensive buildings.

Mr. H. Hall asked if it were absolutely necessary to use the huge switchboards which were provided with modern electric cookers, and whether makers could not devise something simpler and so reduce cost. An electric cooker had been used by his wife for about 15 years, operated by means of a 10-ampere double-pole switch quite satisfactorily. There should be a law to ensure that electricity was kept out of bathrooms altogether; he considered the use of a voltage of 230 in a bathroom as being fatal, unless the apparatus were totally enclosed.

In his area there were 300 electric cookers in use, and they had been operated by quite small switches for a number of years, without huge switchboards, pilot lamps, and so on.

Mr. J. R. Cowie, replying to the discussion, agreed that a plate vent for explosion-proof circuit breakers could be just as effective as wide flanges, but it must be made very carefully indeed; the least buckling of the plates forming the plate vent might increase or decrease the gaps seriously, and one must be very careful to ensure that the vents did not become choked with dust. Many switches would operate six times, but he considered that for it to operate three times constituted a fair test for a general commercial switch. The real test was the condition of the oil, for the amount of carbon formed in it might be very different as between two different faults. Messrs. Reyrolle had a plant, the only one of its kind in the country, with which they could test a 1,500,000-kVA switch actually on short circuit. The plant was extremely costly for one manufacturer to run (the cost of running it on test for a day was about £150, but if the company were asked definitely to prove that a switch had the rupturing capacity claimed for it it could do it. He was not sure, however, that to put a switch to such a test was quite fair, because under those conditions one was asking the switch to do more than it was likely to be asked to do in service. Even at voltages lower than 11,000 the armour-clad gear had won, because it occupied less floor space. If prices alone were compared, armour-clad gear would be more expensive than the cubicle type, but when the cost of buildings was also taken into consideration the armour-clad gear was the less expensive; from the point of view of maintenance it again had the advantage.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

The City and Guilds Examinations.

The papers that were set for the last examination in electrical installation work have given rise to much discussion. The question that first arises is what is the requirement of an installation engineer? Is he to be capable of "installing only" the necessary wiring and plant, or is he to be in a position to "design and test" machinery and plant? I should, as a contractor, have no hesitation in answering that he need know only the installation work, as a thorough knowledge of this work is of much greater importance than a smattering of machine design and testing.

The papers set last year for the City and Guilds Examination fulfilled all the needed tests as to the knowledge of a wireman. The tests were such that a good wireman could have passed, even though untrained, at a technical school, and surely that is the strongest of recommendations. A contractor needs nothing more than a wireman.

A number of teachers have been attacking the examination on account of its elementary nature, but installation work is elementary from a technical standpoint; it is really more an art than a science, and does not require the manipulation of quadratic equations or a knowledge of vectors.

During the past 20 years I have endeavoured to get young wiremen to sit for the City and Guilds Examination, but have failed, owing mainly to the previous high standard of the examination. Now the time is changed, the syllabus is changed, and the examination is put at a reasonable standard.

In these circumstances wiremen, young and old, should sit for the examination, and raise themselves from the level of a labourer to that of a skilled and qualified worker. There is now no "high-brow" teaching to repel them.

The extra-certificate examination might be improved if the syllabus was intended to include the writing of reports on minor jobs, such as a foreman is called upon to make. Foremen often trip up on many points of English, such as the too free use of capitals, &c., but even examiners have been known to end a sentence with a preposition.

I have been accused of trying to keep down the standard of the wireman, but far be this from me. Let the man gain his certificate on the work that he is called upon to do, and then, having his appetite for learning whetted, he may proceed to the electrical engineering classes. I would not drown him in his first or his second year in a sea of technicalities.

It is my hope that these few words may encourage the powers that be to examine on last year's basis, my opinion being formed on 25 years' experience of teaching and 20 years of contracting.

F. Peake Sexton.

Kingston-on-Thames,
February 2nd, 1931.

Electricity in Rural Areas.

I enclose a cutting from a daily newspaper of some prominence. It is to be noticed that wiring is done by tractor drivers resident in the village, who had no previous knowledge of electricity or its installation, and how it can be possible that their work can be passed A.1. by any supply company (as the report states) passes all understanding.

It seems that if national electrification, as applied to the country districts, is going to involve the employment of any class of amateur, then we can look out for a series of dangerous happenings, especially since the pressure and character of the supply are well within the danger limits.

Fireworks.

February 3rd, 1931.

Honorary Officials of the I.E.E.

I was interested in your reference on p. 179 of your issue for January 30th to the resignation of Mr. C. T. Allan as honorary secretary of the Western Centre of the Institution of Electrical Engineers. Sixteen years is a long service in voluntary work of this nature, and the members of the Western Centre are to be congratulated on having had so able a gentleman as Mr. Allan to serve them for so long a period.

We of the Scottish Centre are even more favoured, as Mr. Joseph Taylor has fathered the Centre for the past 18 years and, not unlike a brand of favourite spirit, is "still going strong."

Dr. Magnus MacLean, the G.O.M. of the Scottish Centre, followed Lord Kelvin in the chair in 1901-2, but in 1925-26 he could not resist the charm of association with "J.T.," as he took the chair for a second time.

Edwin Seddon.

Edinburgh, *February 4th*, 1931.

Boiler-house Problems.

I was interested in Mr. W. H. Fethney's review in your issue of January 30th of boiler-house problems, particularly where he deals with stoker-fired as compared with powdered-fuel boilers.

There is no reason why the travelling-grate equipment should not give under everyday operating conditions about as good results as under test conditions, and not lower than those obtained with powdered-fuel plant. Automatic combustion control—not very well understood in this country yet—solves this problem quite easily and readily, and at a good commercial figure. With a boiler completely equipped with automatic combustion control (I do not refer to remote push-button control) it is possible to obtain a steady steam pressure and superheat at the turbine stop valve, notwithstanding a widely fluctuating pressure in the boiler, and at the same time to maintain a high average CO_2 day in and day out, the same as one expects to obtain on a test.

The fireman would then not interfere with his fan speed, or with his dampers. The latter would be automatically controlled, so as to give the correct proportion of air to fuel, giving a complete absence of smoke and reducing ashpit losses to the minimum, and only requiring hand adjustment whenever the fuel quality varied considerably.

With automatic control there is no need to nurse a battery of banked-up boilers. Even on low loads the efficiency is maintained at its highest possible point, and with automatic control it will be advantageous to keep more boilers steaming than with hand control, thus avoiding the banking losses, and these pick up the load very quickly. If the time of the rise in load is known, as it is in some traction stations, then automatic control can be specially prepared to anticipate it.

The opinion is often expressed that owing to the cost of automatic control it can only be applied to very large boilers. This is quite contrary to the fact. I have applied it to quite small boilers, where the annual coal consumption does not exceed 6,000 tons, and the installation was fully paid for in 15 months, notwithstanding the fact that under hand control the boiler efficiency already averaged 77.8 per cent.

The dust and grit matter is another problem, and automatic control will only assist that to the extent of reducing smoke trouble to a minimum.

James Gordon, M.I.Mech.E.

London, W.C.2, *February 3rd*, 1931.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929.

18,004. "Electric speed-control gear for machinery." T. & T. Vicars, Ltd., and J. F. Naylor. July 12th, 1929. (341,489.)

21,110. "Electrical train-influencing systems." Vereinigte Eisenbahn-Signalwerke Ges. August 4th, 1928. (316,868.)

21,717. "Longitudinal suspension for overhead contact lines for electric railways, tramways, and so forth." L. Pontecorvo. July 17th, 1928. (315,763.)

21,722. "Apparatus for electrotherapeutic treatment by means of electron valves for connection to alternating-current mains." J. E. Scheel and W. H. Bull. July 15th, 1929. (341,493.)

22,515. "Pole-type electric switches." Akt. Ges. Brown, Boveri et Cie. July 21st, 1928. (316,106.)

24,341. "Sound-receiving or reproducing instruments or apparatus." A. Marr. August 9th, 1929. (341,495.)

27,880. "Photo-electric cells." Raytheon Products Corporation. November 23rd, 1928. (341,398.)

27,983. "Electric switches." S. Ruppel. September 14th, 1929. (341,499.)

30,135. "Telegraphic receiving systems." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). October 4th, 1929. (341,399.)

30,417. "Amplifier circuits." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 7th, 1929. (341,403.)

30,520. "Control system for radio instruments." W. P. Crilly. October 10th, 1928. (341,464.)

30,558. "Radio receiving sets." J. J. Mettes, Jun. October 8th, 1929. (341,442.)

30,762. "Heater elements for electric discharge devices, and methods of making such elements." Arcturus Radio Tube Co. October 11th, 1928. (341,465.)

30,789. "Arrangements for the protection of circuits against excessive voltages." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 10th, 1929. (341,445.)

30,812. "System of electric winding for timepieces." J. C. Laurent. October 16th, 1928. (341,446.)

30,842. "Electric switches." Wandsworth Electrical Manufacturing Co., Ltd., T. Bachelor, and A. B. Smith. October 11th, 1929. (341,506.)

30,919. "Electric measuring instrument." H. C. Heide (Motor Meter Gauge and Equipment Corporation). October 11th, 1929. (341,467.)

30,944. "Bonding or clamping devices for making electrical connections and for other purposes." J. H. Roberts, R. W. Blades, and J. F. Whitney. October 11th, 1929. (Cognate application on 14,866/30.) (341,468.)

30,949. "Picture and the like telegraph receivers." Telefunken Ges. für Drahtlose Telegraphie. November 26th, 1928. (341,469.)

31,038. "Thermionic amplifiers." International General Electric Co., Inc. October 13th, 1928. (341,472.)

31,119. "Electrical vacuum cleaner." A. Townsend. October 14th, 1929. (341,509.)

31,148. "Automatic electric circuit breakers." British Electrical and Allied Industries Research Association, E. B. Wedmore, and W. B. Whitney. October 14th, 1929. (Cognate applications, 33,001/29 and 8,538/30.) (341,513.)

31,170. "Electrical coupling or connector." C. Leven. October 14th, 1929. (341,422.

31,175. "Ignition apparatus." British Thomson-Houston Co., Ltd., W. Hewitt, and L. Griffiths. October 14th, 1929. (341,424.)

31,401. "Bells." Standard Telephones and Cables, Ltd., L. J. J. Schreiber, and E. H. Preudhomme. October 16th, 1929. (341,478.)

31,402. "Dust covers for telephone and other electrical apparatus." Standard Telephones and Cables, Ltd., B. H. Brown, and C. Hughes. October 16th, 1929. (341,479.)

31,403. "Wave signalling systems." Standard Telephones and Cables, Ltd (Western Electric Co., Inc.). October 16th, 1929. (341,480.)

31,480. "Wireless receivers." Gramophone Co., Ltd., and H. C. Atkins. October 16th, 1929. (341,485.)

31,522. "Electrical generating machines to give drooping-voltage characteristics of the same nature at varying outputs." Greenwood & Batley, Ltd., and J. H. Carrick. October 17th, 1929 (341,518.)

31,549. "Method of connecting directly-heated incandescent filaments of electron valves to the power mains." Loewe-Audion Ges. and B. Wienecke. October 17th, 1928. (341,520.)

31,585. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., R. Taylor, and F. E. Comyn. October 17th, 1929. (341,524.)

31,586. "Oil-filled electric cables." J. B. Hansell and Associated Electrical Industries, Ltd. October 17th, 1929. (Addition to 322,534.) (341,525.)

31,590. "Thermionic valves." Lissen, Ltd., and R. P. Richardson. October 17th, 1929. (341,526.)

31,599. "Photo-electric cells." Arcturus Radio Tube Co. October 18th, 1928. (341,527.)

31,614. "Duplex telegraph systems." Electrical Research Products, Inc. November 19th, 1928. (341,528.)

31,619. "Submarine electric cables." W. S. Smith and H. J. Garnett. October 17th, 1929. (341,529.)

31,625. "Illuminated signs." H. A. C. Goodwin. October 17th, 1929. (341,530.)

31,671. "Loud-speakers." Magnavox Co. March 27th, 1929. (341,531.)

31,691. "Magneto-electric machines." North & Sons, Ltd., and A. Massey-Allen. October 18th, 1929. (Cognate application, 21,746/30.) (341,534.)

31,705. "Electrically insulating sheet material." International General Electric Co., Inc. October 19th, 1928. (341,535.)

31,706. "Synchronous electric motors and systems of control therefor." British Thomson-Houston Co., Ltd. October 23rd, 1928. (341,536.)

31,742. "Telephone or like systems." Associated Telephone and Telegraph Co. November 30th, 1928. (341,541.)

31,792. "Telephone transmission system employing repeaters." Standard Telephones and Cables, Ltd., E. K. Sandeman, P. R. Thomas, and C. R. Dunham. October 19th, 1929. (341,545.)

32,077. "Devices for charging electric batteries." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 24th, 1928. (341,558.)

32,268. "Electric lampholders." E. H. Hill. October 24th, 1929. (341,565.)

32,351. "Method of and means for maintaining secrecy in the transmission of wireless telegraphic messages." W. Broertjes. October 24th, 1929. (341,568.)

32,632. "Wireless reception apparatus." F. W. Lanchester. October 28th, 1929. (Cognate application, 32,894/29.) (341,574.)

32,832. "Guiding searchlight for signalling aerial routes." Anciens Etablissements Barbier, Bernard, et Turenne, Soc. Anon. November 13th, 1928. (341,577.)

32,911. "Mercury-vapour electric rectifiers." General Electric Co., Ltd., and E. Gallizia. October 30th, 1929. (341,578.)

33,325. "Thermostatic control gear for electric starting motors for internal-combustion engines." P. J. Swaffield and Petters, Ltd. November 1st, 1929. (341,591.)

33,340. "Electric mercury-tube switches." I. E. McCabe. November 7th, 1929. (341,600.)

33,952. "Luminous electric discharge tubes." General Electric Co., Ltd. July 11th, 1929. (341,601.)

33,986. "Automatic telephone systems." Siemens Bros. & Co., Ltd., D. A. Christian, and D. P. Long. November 7th, 1929. (341,603.)

34,434. "Regulation of voltage on long lines." Siemens-Schuckertwerke Akt. Ges. November 12th, 1928. (341,610.)

34,886. "Gate-locking apparatus for electric lifts." Etchells, Congdon and Muir, Ltd., and F. Muir. November 15th, 1929. (341,618.)

35,935. "Electric bells." Siemens Bros & Co., Ltd., and G. F. Dutton. November 23rd, 1929. (341,633.)

36,315. "Trolley-wire support for electric railways." Akt. Ges. Brown, Boveri et Cie. May 27th, 1929. (341,636.)

36,803. "Manufacture of coils for electrical purposes." I. N. Whitesmith and Associated Electrical Industries, Ltd. November 30th, 1929. (341,644.)

37,235. "Electromagnetic vibratory devices, such, for example, as loud-speakers." E. V. Mackintosh. December 4th, 1929. (341,647.)

37,492. "Telegraph relays." Elliott Bros. (London), Ltd., and F. N. Kirby. December 6th, 1929. (341,653.)

37,692. "Electrically-driven vacuum cleaners." Electrolux, Ltd. December 10th, 1928. (341,657.)

37,779. "High-frequency electrical transmission systems." Marconi's Wireless Telegraph Co., Ltd. December 8th, 1928. (341,659.)

38,145. "Charging device for electric fuses for projectiles and the like." Rheinische Metallwaarenund Maschinenfabrik. June 6th, 1929. (Addition to 283,585.) (341,664.)

38,295. "Rotors for dynamo-electric machines." British Thomson-Houston Co., Ltd. December 22nd, 1928. (341,666.)

38,403. "Means for electrically heating the water in the engine-cooling system of a motor vehicle, or in a domestic water-supply pipe or the like." S. E. Groves. December 14th, 1929. (341,672.)

38,482. "Means for indicating the position of electric switches and other objects." A. H. Scott and H. Hough. December 16th, 1929. (341,674.)

38,904. "Regeneration in electrically-propelled vehicles." W. A. Stevens. December 19th, 1929. (341,679.)

39,663. "Cable installations." General Cable Corporation. January 4th, 1929. (341,692.)

1930.

1,189. "Alternating-current vapour electrical discharge devices." Hanovia Chemical and Manufacturing Co. October 22nd, 1929. (341,706.)

1,980. "Luminous electric discharge tubes." General Electric Co., Ltd. February 11th, 1929. (341,716.)

2,017. "Ignition apparatus for internal-combustion engines." North and Sons, Ltd., and A. Massey-Allen. January 20th, 1930. (341,717.)

2,473. "Electrical junction boxes." W. J. Garratt, H. Garratt, and H. Wootton. January 24th, 1930. (Cognate application, 9,035/30.) (341,724.)

3,672. "Frequency indication, measuring, and detecting systems." Marconi's Wireless Telegraph Co., Ltd. February 1st, 1929. (341,732.)

4,450. "Inductor coils for electric induction furnaces." Electric Furnace Co., Ltd. December 31st, 1929. (341,741.)

4,551. "Electrically-driven vacuum cleaners." P. Pfeiffer, L. Hahn, W. Mauz, and E. Faber. March 9th, 1929. (341,743.)

5,236. "Transformers." T. Pohl. February 17th, 1930. (341,750.)

5,368. "Automatic and hand-operated electric traffic road control device." J. Bathgate. February 18th, 1930. (341,752.)

6,809. "Electric reversing switches." Chicago Pneumatic Tool Co. March 2nd, 1929. (341,763.)

7,405. "Radio and similar high-frequency communication systems." Telefunken Ges. für Drahtlose Telegraphie. March 8th, 1929. (Addition to 332,834.) (341,766.)

8,084. "X-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 30th, 1929. (341,773.)

9,704. "High-frequency receiving systems." Marconi's Wireless Telegraph Co., Ltd. March 30th, 1929. (341,786.)

9,798. "Electric cooking and heating stoves." J. Becker and L. A. Laursen. March 27th, 1930. (341,788.)

10,003. "Electrically-driven doubling spindles." Siemens-Schuckertwerke Akt. Ges. April 5th, 1929. (341,790.)

10,743. "Electric reversing switches." Consolidated Pneumatic Tool Co., Ltd., and G. Scott. April 4th, 1930. (341,794.)

10,769. "Electrical transformers." K. Fischer. February 13th, 1930. (341,795.)

11,803. "Electrical timing arrangements." Telefonaktiebolaget L. M. Ericsson. April 15th, 1929. (341,801.)

11,833. "Thermionic amplifiers." E. Asch. April 16th, 1929. Addition to 300,511.) (341,805.)

12,805. "Electric picture-transmission systems." British Thomson-Houston Co. Ltd. April 25th, 1929. (341 811.)

12,824. "Raising and lowering device for the tanks of oil switches." Siemens-Schuckertwerke Akt. Ges. May 18th, 1929. (341,812.)

12,910. "Electric circuit breakers." Associated Electrical Industries, Ltd April 27th, 1929. (341,814.)

13,364. "Picture telegraph apparatus." Telefunken Ges. für Drahtlose Telegraphie. April 30th, 1929. (341,818.)

15,108. "Process for the manufacture of oxide cathodes for electric discharge tubes." Egyesult Izzolampa es Villamossagi Reszenytarsasag. December 23rd, 1929. (341,826.)

15,159. "Copper oxide and like rectifiers for electric current." British Thomson-Houston Co., Ltd. May 18th, 1929. (341,827.)

15,257. "Induction controllers." Electrical Apparatus Co., Ltd., and R. H. Barbour. May 17th, 1930. (Addition to 330,819.) (341,828.)

15,466. "Means for disconnecting metal-vapour rectifiers on the occasion of a reverse arc." U. Lamm and Allmänna Svenska Elektriska Aktiebolaget. May 20th, 1930. (341,830.)

15,913. "Circuit-breakers for direct-current electric circuits." Associated Electrical Industries, Ltd. May 27th, 1929. (341,831.)

16,421. "Radio-telephonic systems." R. Bruni. May 28th, 1929. (Addition to 314,092.) (341,832.)

22,357. "Automatic electric welding machines." International General Electric Co., Inc. July 25th, 1929. (341,838.)

25,245. "Thermionic tube circuits for wireless reception." L. T. Barker. August 23rd, 1930. (341,840.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 4th :—

Rex. No. 515,609. Class 6. Carpet sweeping and vacuum cleaning machines.—Joycenda, Ltd., 1-3, Lower Loveday Street, Birmingham

Deunichrom. No. 518,690. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—British Driver-Harris Co., Ltd., Gaythorn Mill, Albion Street, Manchester.

Crabtree. No. 484,048. Class 13. Metal goods for use in electric lighting, heating, signalling, and power installations. No. 484,050. Class 50. The same made wholly or mainly of insulated non-current-conducting materials.—J. A. Crabtree & Co., Ltd., Lincoln Road, Walsall.

Impervo. No. 518,258. Class 50. Tapes consisting of a textile material impregnated with india-rubber.—Confield Rubber Co., U.S.A., and 27-18, Noble Street, E.C.2.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BIRMINGHAM.—Reconstruction of Kent Street baths (£65,840); T. Johnson, contractor. Library, Highfield Road, Yardley Wood; and improvements, various elementary schools (£40,000); city engineer.

BISHOP'S STORTFORD.—Rebuilding business stores for the International Tea Co.'s Stores, Ltd., Mitre Square, London, E.C.; A. D. Letch, builder, Braintree.

BLACKPOOL.—Technical college, Palatine Road; Dr. Ikin, director of education.

BRAINTREE.—Fire station, Drury Lane; U.D.C. surveyor.

BURTON-ON-TRENT.—Schools, Clarence Street, for the borough E.C.; Horne & Knight, architects, Russell Square, London, W.C.

CARDIFF.—Housing scheme, Racecourse site; city engineer.

CHELMSFORD.—Library; R. A. Cordingley, architect.

CHELTENHAM.—Housing scheme (40 acres), Brooklyn Road; borough engineer.

COLCHESTER.—Houses (52), Old Heath estate (£17,668); borough engineer.

CREWE.—School (640 places), West End, for the borough E.C.; H. F. K. Feltham, clerk.

DERBY.—Houses (429); borough engineer.

DEVONPORT.—Reconstruction of Electric Theatre, Fore Street; Electric Theatre, Ltd.

DEWSBURY.—Girls' secondary school for the borough E.C.; T. Blakeley, borough architect. Extensions, technical college, including electrical engineering department, for the borough E.C.; director of education.

DUDLEY.—Houses (52) for the T.C.; McKeand, Smith and Co., builders. Bakery, Priory estate; Dudley Co-operative Society, Ltd. Hotel, Priory estate; Mitchells and Butler, Ltd. Council school (880 places), Blowers Green; J. W. Whaley, director of education, Education Offices.

DURHAM.—School, Lanchester; F. Willey, architect, 34, Old Elvet.

EASTBOURNE.—Flats and houses, Corporation Road; borough engineer. Stores, Milton Road, for Brighton Equitable Co-operative Society, Ltd.; A. Ford, architect.

ERITH.—Council offices for the U.D.C.; H. Hind, surveyor.

ESSEX.—Schools, Clacton-on-Sea, for the county E.C.; director of education, Chelmsford.

GLAMORGANSHIRE.—School, Glyn Heath, for the county E.C.; director of education, Cardiff.

GLASGOW.—Factory extensions, Logan Street; Macmillan and Monro, Ltd.

GODSTONE.—Houses (56) for the R.D.C.; surveyor.

GUILDFORD.—School, Westborough housing estate, for the borough E.C.; director of education.

HALIFAX.—Business stores, Old Market, for Montague Burton, Ltd., Leeds.

HAYES (MIDDLESEX).—Houses (1,248), Grange Farm; Taylor, Woodrow, Ltd., Blackpool.

HULL.—Houses (300), Kirklands Road; F. R. Waller. Houses (50), Murrayfield Road; A. H. Evans & Co. Reconstruction of the Capitol Cinema; C. H. Benwell. Baths (£44,000) and poor law hospital, Anlaby Road (£285,000); city architect. Waterworks, Kelleythorpe (£766,000); city engineer.

ILMINSTER.—Cinema theatre for the Ilminster Cinema Syndicate; J. E. Hallett, secretary, Market Square.

IRISH FREE STATE (DUBLIN).—Installation of electric lighting, &c., at University College; R. M. Butler, architect, 82, Merrion Square.

KENT.—Central schools, Goudhurst, Wrotham, Birchington, Elham Valley, Matfield Green, Burham, Chartham, Cheriton, Faversham, Harrietsham, Headcorn, Lynsted, Newington, Orlestone, Sandwich, Sutton-at-Hone, and Yalding, for the county E.C.; director of education, Maidstone.

KIRBY MOORSIDE.—Re-erection of Welburn Hall (mansion), residence of Major Shaw (£50,000).

LANARKSHIRE.—Special school for the unemployed, Motherwell, for the county E.C.; the master of works, Hamilton.

LANCASHIRE.—Cinema, Railway Street, Earlstown; L. A. C. Pritchard, architect, 57, Moorfields, Liverpool.

LEEDS.—Houses (124) and flats (88), Potterdown estate; city architect. Council school (1,360 places), Middleton; architect's section, Education Offices, Calverley Street.

LEICESTER.—Police quarters (£59,887) for the T.C.; city surveyor.

LIVERPOOL.—Additions to premises, Islington Street, Salford, for the Royal Liver Friendly Society; Stewart McLauchlan, architect, 349, Royal Liver Buildings.

LONDON (PALMER'S GREEN, N.).—Baptist church; trustees. (WALWORTH, S.E.).—Cinema, Walworth Road; H. W. Binns, 12, Soho Square, W.C.

MAIDENHEAD.—School, North Town (£22,976), for the borough E.C.; Leathert & Granger, architects.

MARKET BOSWORTH.—Houses (70); R.D.C. surveyor.

MITCHAM.—Re-erection of Lea Park Works, Princes Road, Colliers Wood, for J. Ferguson & Son (£100,000).

NORTHERN IRELAND (BELFAST).—Additions to premises of John McKeill, Ltd., 109, Corporation Street; John Seeds, architect, 7, Donegall Square. Extensions and additions to the Ulster Hospital for Women and Children, Templemere Avenue; Tullock & Fitzsimons, architects and engineers, Bank Chambers, Castle Place.

OLDBURY.—Three schools for the E.C.; director of education.

OLDHAM.—Houses (1,500) during the next five years; and public wash-houses, Hollinwood; borough engineer.

OSWALDTWISTLE.—Reconstruction of sewage works; surveyor to U.D.C.

PADDOCK WOOD (KENT).—Fruit canning factory, Wisbech Produce Canners, Ltd., 5, St. Pancras Market, N.W.

PRESTON.—Cinema, Penwortham; J. Spencer & Sons, builders, Liverpool.

REDCAR.—Houses (150) for the T.C.; borough surveyor.

RETFORD.—Houses (50); borough engineer.

SMETHWICK.—Houses (148), Warley estate; borough engineer. Baths, Bearwood (£43,978); H. N. Nowell, Ltd., Stockton-on-Tees. Hotel, High Street; Mitchells and Butler, Ltd. Shop, Abbey Road; Birmingham Co-operative Society, Ltd.

STAFFORDSHIRE.—Schools, Stoke-on-Trent and Eccleshall, for the county E.C.; director of education, Stafford.

SURREY.—Schools, Cheam Common (£16,144), for the county E.C.; W. W. Finny, secretary, Kingston-on-Thames.

WATFORD.—Buildings and offices, St. Albans Road; Messrs. Lavers.

WALSALL.—Extensions, Field Street schools (£16,854), for the borough E.C.; Green & Bird, builders, Hednesford.

WEST HARTLEPOOL. — Infectious diseases hospital; Francis Durkin, borough engineer, Municipal Buildings.

WICKERSLEY (ROTHERHAM).—Houses (70) for J. C. Lister.

WORCESTERSHIRE.—Senior school, Hagley, for the county E.C.

WORTHING.—Church, Broadwater Green (£10,000), for the Wesleyan trustees; W. E. Lewin. School, Poor's Ten Acres, for the borough E.C.; director of education.

WREXHAM.—Houses and three blocks of flats, Maesydre, for the T.C.; borough surveyor.

YEOVIL.—Re-erection of business premises, electrically equipped, Frederick Place, for K. Dicks, radio engineer.

YORK.—Houses (134) for the T.C.; F. W. Spurr, city engineer.